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ABSTRACT

Begun in June, 1971 and completed in October 1973, the study had the following specific goals: to define the cardiologist's role; to determine cardiology training program objectives; to determine manpower needs for cardiologists; and to determine the educational needs of cardiologists. The major information was sought from all active cardiologists and all cardiology training programs in the United States and employed the use of questionnaires, log-diaries, content analysis, and interviews. The data furnishes an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. It also provides a description of the current practice of cardiology and identifies deficiencies in existing training programs in cardiology. Further, the study projects the future activities of the cardiologist, an aid in planning future training experiences for them. Contributors to the study include: W. H. Abelmann, S. Abrahamson, F. H. Adams, N. O. Fowler, P. L. Frommer, R. W. Gifford, Jr., R. A. Girard, W. P. Harvey, H. N. Hultgren, F. Y. K. Lau, H. D. McIntosh, R. C. Mendenhall, W. D. Nelligan, W. H. Pritchard, A. Soffer, and H. J. C. Swan. (MW)

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EVALUATION OF CARDIOLOGY TRAINING AND MANPOWER REQUIREMENTS

Edited by
Forrest H. Adams, M.D.
and
Robert C. Mendenhall, M.S.

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CONTRIBUTORS

Walter H. Abelmann, M.D., Professor of Medicine, Harvard Medical School

Stephen Abrahamson, Ph.D., Professor and Chairman, Department of Medical Education, University of Southern California School of Medicine

Forrest H. Adams, M.D., Professor of Pediatrics (Cardiology), Head, Division of Cardiology, University of California, Los Angeles School of Medicine

Noble O. Fowler, M.D., Professor of Medicine, Director, Division of Cardiology, University of Cincinnati College of Medicine

Peter L. Frommer, M.D., Associate Director for Cardiology, Division of Heart and Vascular Diseases, National Heart and Lung Institute, National Institutes of Health

Ray W. Gifford, Jr., M.D., Head, Department of Hypertension and Nephrology, Cleveland Clinic Foundation

Roger A. Girard, Ph.D., Research Associate, Department of Medical Education, University of Southern California School of Medicine

W. Proctor Harvey, M.D., Professor of Medicine, Director, Division of Cardiology, Georgetown University School of Medicine

Herbert N. Hultgren, M.D., Professor of Medicine, Stanford University School of Medicine and Chief, Cardiology Service, Palo Alto V.A. Hospital

Francis Y. K. Lau, M.D., Professor of Medicine, University of Southern California School of Medicine, Chief of Cardiology USC-LAC Medical Center

Henry D. McIntosh, M.D., Professor and Chairman, Department of Medicine Baylor University School of Medicine

Robert C. Mendenhall, M.S., Research Associate, Department of Medical Education, University of Southern California School of Medicine

William D. Nelligan, Executive Director, American College of Cardiology

Walter H. Pritchard, M.D., Professor of Medicine, Case Western Reserve School of Medicine

Alfred Soffer, M.D., Executive Director, American College of Chest Physicians

H. J. C. Swan, M.D., Director, Department of Cardiology, Cedars Sinai Medical Center

PREFACE

Beginning in June 1967, the National Heart and Lung Institute supported a study conducted by the Sub-Board of Pediatric Cardiology of the American Board of Pediatrics entitled "Evaluation of Pediatric Cardiology: Training and Testing." This study involving all of the diplomates of the Board of Pediatric Cardiology had 3 major goals:

1. To define the professional roles and essential competence of the pediatric cardiologist;

2. To develop and evaluate approaches for assessing the competence of the pediatric cardiologist, and

3. To determine the broad objectives of training programs in pediatric cardiology.

From the outset, the Board realized that professional competence in medical education relevant to testing techniques and evaluation would be necessary for the successful completion of the project. Accordingly, a sub-contract for appropriate portions of the work was let to the Division of Research in Medical Education, University of Southern California School of Medicine under the direction of [illegible]. The study, the first of its kind of medical specialists, proved to be very successful as [illegible] percent of the diplomates participated in various aspects. Subsequently, several papers were published describing the findings of the study including an assessment of the manpower and training requirements in the field of pediatric cardiology[1,2,3].

It occurred to several of us involved in the study of pediatric cardiologists, that the techniques utilized in it could be applied to other specialty groups. As an officer of the American College of Cardiology, I realized how little we in the College knew about our colleagues in adult cardiology. We knew relatively little about their primary training in cardiology and how well this training was meeting their current professional needs. Such information would also be of help in continuing educational programs such as those offered by the various professional societies as well as the universities. Few of us could truly guess what most cardiologists did with their professional time, and what they con-

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[1] [illegible], et al., "Evaluation of an Oral Examination Used in Specialty Board Certification." J. Med. Educ., [illegible].

[2] Adams, F. H., et al., "The Design and Validation of Certification Procedures in Pediatric Cardiology." J. Med. Educ., [illegible].

[3] Adams, F. H., et al., "Manpower and Training Requirements in Pediatric Cardiology." Pediat., [illegible].

[illegible] the United States. Furthermore, nothing was known regarding the [illegible] "Building a National Health-Care System"*.

With the above as background, the American College of Cardiology in April [illegible] sought and obtained a contract with the National Heart and Lung Institute to conduct a study with the following specific purposes:

1. To define the current professional roles of the cardiologist.

2. To determine the objectives of training programs in cardiology.

3. To determine the current and future manpower needs of cardiologists.

4. To determine the current and future educational needs of cardiologists.

In order to provide the study with a broad base of expertise and cooperation, it was deemed advisable to establish an Advisory Committee [illegible] consisting of individuals representing the major professional groups interested in cardiology. Accordingly, the following organizations agreed to be represented by the individuals named after each:

American College of Cardiology - [illegible], M. D.
American Heart Association - [illegible], M. D.
American College of Chest Physicians - [illegible], M. D.
Association of University Cardiologists - [illegible], M. D.
Subspecialty Board in Cardiovascular Disease - [illegible], M. D.

In view of the fact that the Division of Research in Medical Education (DRME), University of Southern California School of Medicine, [illegible]

[illegible]

*Committee for Economic Development, April [illegible].

In the final phases of the study, the Advisory Committee received considerable help and guidance from two additional individuals: [illegible] [illegible], M.D., Chairman, Subspecialty Board in Cardiovascular Disease and [illegible] [illegible], M.D., President-Elect, American College of Cardiology.

Throughout the entire study, Mr. Robert C. [illegible], Associate Project Director, was the individual most responsible for the development of the survey instruments and the analysis of the data generated by them. Mr. William D. [illegible], Executive Director of the American College of Cardiology, [illegible] [illegible] [illegible] [illegible] [illegible] of the [illegible] of the Advisory Committee. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and members of the staff also contributed significantly to all phases of the study.

[illegible], M.D.
Principal Investigator
American College of Cardiology

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d. Training programs questionnaire (Cardiovascular Training Programs Survey:

Training program directors were asked to describe program content, objectives, capabilities and staffing, through a questionnaire.

The methodology used in this study, if revised periodically, would yield a data base from which trends could be determined to assist in planning for the future.

3. There were 10,691 cardiologists in active practice in the United States and approximately 1,000 in training in December, 1971. This gives a ratio of 5.6 cardiologists per 100,000 population. Whether this is an optimal ratio to be maintained in the future cannot be stated. Their numbers seem to be distributed about equally between the Primary Cardiologist (one who estimates that he spends 50 percent or more of his professional time providing care for patients with cardiac problems) and the Secondary Cardiologist (less than 50 percent). Approximately 70 percent are based in offices not in institutions. About 50 percent of all cardiologists are certified in internal medicine and 10 percent certified in cardiovascular disease.

Per population density, cardiologists are irregularly distributed, tending to concentrate in the metropolitan centers of the Northeast, Middle Atlantic, and Pacific regions. These areas contain the large cities having the heaviest concentration of medical schools. The East South Central, West South Central, and West North Central regions contain significantly fewer numbers of cardiologists per 100,000 population.

On the basis of a cardiologist-to-population ratio of 6 per 100,000, it is projected that approximately 4,600 more cardiologists are needed in the next five years. The problem of maldistribution and some other factors altering the projected needs are not reflected in that projection.

4. Four general profiles of cardiologists were identified on the basis of types of activity: Primary Non-Institutional; Secondary Non-Institutional; Primary Institutional and Secondary Institutional. Clearly, certain activities overlapped from one category to another, but the general activities appeared to differ to a degree sufficient to justify separation. These four divisions of cardiologists described by the survey can perhaps be identified by more appropriate terms than Institutional or Non-Institutional, Primary or Secondary. That is, the group of Non-Institutional Primary Cardiologists may be looked upon as Clinical Cardiologists, while the Secondary Non-Institutional Cardiologist is usually the Internist-Cardiologist. The Institutional Primary Cardiologists devoting more than 50 percent of their time to problems of cardiovascular disease would likely include a substantive proportion of Cardiac Specialists, while the Institutional Secondary Cardiologists might include both the

Academic Cardiologist and those physicians collected under "other" who might have an infrequent occupation, for example, cardiac rehabilitation. A brief conceptual description based upon the data of this study of functions and activities of these four categories of cardiologists is described in the report.

5. There are 329 programs in the United States which offer at least one year of organized training in cardiology within an approved internal medicine training program. These programs have an average of four trainees per program. Approximately 711 trainees completed their training in 1972 and 791 trainees did so in 1973.

   Training facilities in the United States have expanded over the past ten years and, based on training directors' estimates, will continue to do so. It is possible to accept 58 percent more trainees during the next five years. Clearly, to achieve this would require increased funding.

   A shortage of staff members presently exists in many training programs. Twenty-nine percent of programs have an average of two staff positions budgeted but unfilled - a total of approximately 150-180 positions. If training programs expand over a five-year period (1973 to 1978) to increase the number of trainees by 58 percent, an average of 2.6 additional staff members will be required for each program. This is an increase of approximately 800 to 850 new staff members.

   The present system for training of cardiologists in the United States should be continued, taking into account the recommendations of the Subspecialty Board of Cardiovascular Disease.

   Federal support for training certain groups of cardiologists, particularly the Academic Cardiologist (Secondary Institutional), should be continued at a rate commensurate with population changes and related demands for trained cardiologists.

   The cardiology training needs of internists and generalists (Secondary Non-Institutional) should be continually evaluated and their training within programs of internal medicine modified accordingly.

   Programs need differentiation as to which of the four types of cardiologist is being trained, with the numbers trained adjusted to geographic area needs. This implies a level of program planning not currently practiced but one which, nevertheless, is required if the minimum ratios of cardiologists to population are to be realized.

   Directors of cardiology training programs should receive continuing information as to the needs of their graduates, including a copy of this study report, a report from the American Board of Internal Medicine regarding areas of deficiency in cardiovascular training based on the results of examination of their trainees, and an annual meeting with the other directors of similar programs.

6. The continuing educational needs of the cardiologists are currently varied and diverse. They appear to be influenced by (1) the type and content of his original training and (2) the role and age of the cardiologist. In the future, continuing educational needs will be influenced by (1) the role of certification in a national health care system, (2) regional considerations, (3) advances in medical knowledge, and (4) stable funding.

7. The standards for cardiovascular diagnosis and surgical centers developed by the American Heart Association and the Inter-Society Commission for Heart Disease Resources should be implemented.

8. This study provides, for the first time, data which furnish an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. The data collected provide a description of the current practice of cardiology and identify deficiencies in existing training programs in cardiology. Further, this study projects the future activities of the cardiologist, and thus will aid in planning training experiences for them. The data collected should be of value to individuals, hospitals, universities, governmental agencies, and voluntary health agencies which are concerned with providing administrative, financial, and educational support for training programs in cardiology, and which require cardiologists for patient care, teaching, and research activities.

CHAPTER 1

DEVELOPMENT OF THE STUDY

Forrest H. Adams, Stephen Abrahamson and Robert C. Mendenhall

BACKGROUND TO THE PROBLEM

Cardiovascular disease, particularly atherosclerosis, represents today the greatest and most important health problem in the United States as well as in many parts of the world. Cardiovascular disease accounts for over one-half the deaths in the United States[1]. Every American male at age 20 has one chance in five of having a heart attack (usually myocardial infarction) before the age of 60. It is estimated that over 14.6 million American adults have definite heart disease and an additional 13.0 million have suspected heart disease. This represents 24.9 percent of the adult American population[2].

Each year approximately 200,000 of the heart disease deaths occur in persons under the age of 65 with men affected 3.5 to 1 as compared with women[1]. Thus, unfortunately, this disease often appears during the most productive years. It has been stated that the cost of disability in patients surviving coronary disease is in excess of 4 billion dollars per year[3]. It is obvious that the total loss to the nation is incalculable. Based on our present knowledge, it is a realistic premise that cardiovascular disease will increase in this country rather than decrease.

Recently introduced methods in the diagnosis and treatment of cardiovascular diseases are effective only if skilled physicians and other personnel become available to deliver optimal health care. It is obvious that support for teaching and research activities must proceed in parallel. Urgently needed was an evaluation of manpower requirements in cardiology to make these benefits available to all.

The officers of the American College of Cardiology realized how limited our knowledge was regarding cardiologists: their training; their continuing educational needs; their roles and their competencies; their locations and types of practice. Furthermore, there existed no complete list of training programs available in cardiology in the United States and thus the content, quality, duration of training, and number of positions offered was unknown.

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[1] Vital Statistics of the United States 1967. Vol. 2, Part A, 1969.

[2] Heart Disease in Adults, United States, 1960-62. PHS Publication No. 1000. Series 11, No. 6, September 1964.

[3] Felton, J.S. and Cole, R., Circulation 27:957-962, 1963.

For the above reasons, the American College of Cardiology sought and obtained a contract with the National Heart and Lung Institute, National Institutes of Health for the following purposes:

- To define the current professional roles of the cardiologist;
- To determine the objectives of training programs in cardiology;
- To determine the current and future manpower needs of cardiologists;
- To determine the current and future educational needs of cardiologists;
- To review and to prepare the results of the study in a form appropriate for dissemination through usual professional channels and to make recommendations to the National Heart and Lung Institute for improving the availability of manpower in this field.

The study began June 30, 1971 and was completed October 31, 1973.

ORGANIZATIONAL APPROACH TO THE PROBLEM

In its proposal to the National Heart and Lung Institute to conduct a comprehensive study of cardiology training and manpower requirements, the American College of Cardiology recognized that such a study would be most effective as a blueprint for change if it had a Principal Investigator and an Advisory Committee whose members were broadly representative of major societies and organizations concerned with cardiovascular disease. The Advisory Committee, thus, included members from each fo the following organizations:

American College of Cardiology

American Heart Association

American College of Chest Physicians

Association of University Cardiologists

Subspecialty Board in Cardiovascular Disease

Furthermore, it was part of the overall project plan from its inception to consult with the American Medical Association and the American Board of Internal Medicine as the study progressed for advice in certain areas and for information which might enhance the study.

The American College of Cardiology sought a research organization which had worked in the physician manpower and assessment area previously and chose the University of Southern California School of Medicine's Division of Research in Medical Education (DRME) as its principal research resource because DRME had performed a similar study of pediatric cardiology. Indeed, the overall research plan proposed was developed jointly by the American College of Cardiology and DRME.

ORGANIZATIONAL RELATIONSHIPS

Conceptually and in actual fact, the American College of Cardiology through its Principal Investigator had responsibility for the project throughout the developmental, implementation and analysis phases. The Advisory Committee participated in survey instrument design, provided counsel regarding the number and types of cardiologists and/or institutions to be included in each study phase and recommended the level of analysis which each of the studies received. The Advisory Committee did so in recognition of the fact that after the data were collected, it was their responsibility to generate substantive evaluative statements and conclusions.

Following the agreements reached with the American College of Cardiology's Principal Investigator and the Advisory Committee, University of Southern California's DRME Cardiology Project Staff under a subcontract designed the studies, tested the instruments, conducted the studies, and provided the data deemed most appropriate to the ultimate study tasks. Thus, while the data were obtained by University of Southern California's DRME from study designs which they developed, the ultimate responsibility for the study's interpretive conclusions and recommendations were the American College of Cardiology's.

STUDY POPULATIONS

For the purposes of the study, cardiologists were defined as all physicians who were one or more of the following:

- Physicians listed by the American Medical Association as having either a primary or secondary specialty interest in cardiovascular disease;
- Fellows of the American College of Cardiology;
- Fellows of the Council of Clinical Cardiology of the American Heart Association;
- Diplomates of the Subspecialty Board in Cardiovascular Disease.

  (Radiologists, surgeons, pediatric cardiologists, and pathologists were excluded even if they met one of the criteria noted above.)

It was recognized that such a listing of cardiologists would be quite redundant; however, one study objective was to identify all cardiologists and therefore the redundancy was acceptable. The resultant roster of 13,171 cardiologists in active practice, training, and retired included [illegible] in active practice of whom less than 3 percent came from sources other than the American Medical Association's listing.

Training Programs were defined as full-time cardiovascular training programs of at least one year's duration. This definition was developed during the study when it became apparent that there were no listings of cardiovascular disease training programs and there were no criteria for determining which of the training programs offered the variety and depth of training experiences which might reasonably prepare a physician for certification in cardiology.

The source listing for training programs was provided by the American Medical Association and consisted of all institutions in the United States with approved residencies in Internal Medicine. It was assumed that very few cardiovascular disease training programs would be found in institutions which did not have an approved training program in internal medicine. This study included [illegible] institutions involved in cardiovascular disease training.

STUDY FOCUS AND METHODS

The major information in this study was sought from all active cardiologists and all cardiology training programs in the United States. The cardiologists were ultimately divided into a number of subgroups for various types of analyses. Two major groups were empirically defined as Primary Cardiologists (those practicing cardiology more than 50 percent of their total) and Secondary Cardiologists (those practicing cardiology less than 50 percent of their total). The Advisory Committee also agreed to examine secondary data, i.e., that which was not generated by the investigators, in those instances where such data would reasonably enhance their recommendations.

The methods employed in the investigation were proven behavioral science techniques: questionnaires; log-diaries; content analysis and interviews. The specific study designs which were used most successfully involved questionnaires and a log-diary. The latter, as conceptualized, is an instrument uniquely suited to this type of study.

STUDY DESIGNS

With a major study premise being that those who provide services to patients, perform research, provide teaching, and design and carry out the training programs are the best possible source of data regarding both current practices and immediate and future needs, a research plan was developed which drew almost exclusively on these individuals and institutions for data.

The cardiologists participated in three study phases:

1. An annual classification questionnaire to all;
2. A log-diary to a stratified random sample;
3. A training experiences and needs questionnaire to a stratified random sample.

All cardiology training programs participated either through completion of a detailed questionnaire or through an interview conducted by telephone.

Detailed study design considerations will be discussed in the next chapter. The investigators gathered much information regarding training programs which exceeded the needs of the Advisory Committee. A data base was created which could profitably be exploited more than this study required.

STUDY DESIGN PROCESS

At the very beginning, the Advisory Committee participated directly with the University of Southern California (USC) Project Staff in the identification of the appropriate areas of investigation for each of the study phases. The Project Staff then developed an initial set of questions for obtaining the information. The questions were reviewed and altered by the Advisory Committee and the DHEW Project Officer and then the particular study document was given its final format. Upon completion of this review, the particular instrument with its sampling rationale was sent to the Federal Office of Management Budget (OMB) for their detailed review and assignment of a survey control number. OMB also had recommendations which were incorporated in the final design.

While the preceding may sound unduly complicated and complex, it had the positive effect of involving all interested parties in the details of the survey design process. The process consumed many months and required preparation of several drafts of each study instrument.

SUMMARY

This study provides, for the first time, data which permit an estimate of present and future manpower needs for cardiologists in the fields of patient care, teaching, and research within the United States. The data collected provide a description of the current practice of cardiology and identify deficiencies in existing training programs in cardiology. Further, this study projects the future activities of the cardiologists, and thus, will aid in planning training and experiences for them. The data collected should be of value to individuals, hospitals, universities, governmental agencies, and voluntary health agencies who are concerned with providing administrative, financial and educational support for training programs in cardiology, and who require cardiologists for patient care, teaching and research activities.

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FIGURE 2

CARDIOLOGY SURVEY

OMB Approval 68871116

This short survey form will provide a measure of how cardiology is practiced nationally and give the needed indicators for other phases of the Cardiology Manpower Study. Your answers are vitally important. Please answer all questions, including your best estimate of numbers or percent when asked. Thank you for your help.

NAME________________________ STREET______________________________

CITY__________________ STATE__________________ ZIP CODE__________

YEAR YOU RECEIVED MD________

YOUR MEDICAL SPECIALTIES

Primary Specialty____________________
Years of Practice in Primary Specialty________
% Time Now Spent in This Specialty________

Secondary Specialty____________________
Years of Practice in Secondary Specialty______
% Time Now Spent in This Specialty________

YOUR MEDICAL SERVICE COMMUNITY

About how many people live within a 25 mile radius of your office? (Please check ☑ the figure which is closest to the number.)

25,000 - ○	800,000 - ○
50,000 - ○	1,000,000 - ○
100,000 - ○	2,000,000 - ○
200,000 - ○	3,000,000 - ○
400,000 - ○	4,000,000 - ○
600,000 - ○	5,000,000 - ○

Please estimate the percentage of your cardiac patients who live within the distances indicated from your office.

Miles	Percent
Less than 5 miles	______
From 5 to 10 miles	______
From 11 to 15 miles	______
From 16 to 25 miles	______
Over 25 miles	______
	Total 100%

REGARDING YOUR PROFESSIONAL TIME AND HOW IT IS COMMITTED. Please estimate the total percent by category and the portion of that total which goes to cardiology applications.

Activity Category	Percent of Total Professional Time Committed to	Percent of Activity Time Applied to Cardiology*
Direct Patient Care - not involving research/teaching	______	______
Medical Research - involving patient care	______	______
Medical Research - not involving patient care	______	______
Medical Teaching - involving patient care	______	______
Medical Teaching - not involving patient care	______	
Administrative (office, committees, staff member executive organization, etc.)	______	*Each "Percent of Activity Time" may be up to 100%
[illegible]tional (journals, meetings, papers, etc.)	______	
	Total 100%	

[illegible]urs per Week Devoted to Medical Activities ☐ If not currently professionally active, check here ○

YOUR PATIENT SOURCES. During the past three months, what proportion of your cardiac patients came from:

Source	Percent
Within your own practice	______
Referred by other physicians	______
Referred by your own patients	______
Referred by themselves, family or friends	______
Referred by an agency (insurance company, union, etc.)	______
Other (Specify):__________	______
	Total 100%

YOUR EMPLOYMENT ARRANGEMENTS. Several employment arrangements may be involved in your practice. Please estimate your involvement in each:

Employment Arrangement	Percent of Time
Self: "solo"	______
Self: Partnership or other non-group arrangement	______
Group	______
Hospital: any type	______
Medical School	______
Other Employment (Specify): ________________	______
	Total 100%

CARDIOLOGY ACTIVITIES. Do you participate in or perform any of the following:
(CHECK ☑ ALL THAT APPLY.)

Office consultant for cardiac patients----- ○
Office ECG Reader ---------------------- ○
Hospital consultant for cardiac patients--- ○
Hospital ECG Reader ------------------- ○
Hospital coronary care unit committee--- ○
Cardiac diagnostic roentgenography----- ○
Cardiac catheterization --------------- ○

THIS COMPLETES THE QUESTIONNAIRE. THANK YOU FOR YOUR COOPERATION.

Response Rates and Characteristics of Respondents

Table 1 summarizes the response statistics for this survey and indicates the numbers that were not usable and for what reasons. This table notes that

77 percent of all eligible cardiologists responded;

80 percent of the active cardiologists responded;

68 percent of the active population provided returns which were used in the study analyses.

The table, read from left to right, gives the type of cardiologist in broadly descriptive terms and the overall number for each type in the portion labeled "Cardiology Study Population." In the rows of figures which follow, the percentages relate to the total number for each stratum. Thus, 8053 questionnaires were received from the non-federal active physicians for a response rate of 80.2 percent; losses due to "non-use" factors reduced the number included in the analyses ("Use" column) to 6884 (68.6 percent) and the true non-respondents for this type of cardiologist amounted to 19.8 percent of the total. It is also evident from the "Active Subtotal" column that the response rate was 80 percent; non-use rate was 11 percent; use rate 68 percent and non-respondents amounted to 20 percent.

The lower half of this table accounts for those cardiologist strata of only peripheral interest to the study. The survey form was not designed for the practice situation or interest of these cardiologists except for the "In Training" stratum or the "Retired" who might have resumed active practice. The numbers associated with each "Cardiology Study Population Strata" were obtained exclusively from the secondary data sources used to define the eligible population. Those associated with the column, "Non Respondents," are also from the secondary sources. The "Respondent Classification" numbers describe the questionnaires received and, therefore, reflect an updated cardiologist practice classification. Some known shifts in classification occurred:

- 63 "in-training" cardiologists responded as active;
- 56 cardiologists were reported as deceased - 46 from the "retired" group;
- an unknown number of "active" cardiologists responded as "retired" - probably at least as many as those noted above for "in-training" shifts.

Errors in Estimates Attributable to Sampling

Since the entire population of cardiologists was surveyed, sampling error, per se, is not an issue. However, prior to considering the effects of non-response,

TABLE 1

CARDIOLOGIST STUDY POPULATION STRATA BY RESPONDENT CATEGORIES

Cardiology Study Population		Respondent Classification			Non Respondents
Type	Number	Received	Non-Use*	Use	
Non-Federal	10,040	8053	1169	6884	1987
(active) % of type	(100.0)	(80.2)	(11.6)	(68.6)	(19.8)
Federal	651	472	53	419	179
(active) % of type	(100.0)	(72.5)	(8.1)	(64.4)	(27.5)
Active Subtotal	10,691	8525	1222	7303	2166
% of Subtotal	(100.0)	(79.7)	(11.4)	(68.3)	(20.3)
In Training	1042	571	147	424	471
% of type	(100.0)	(54.8)	(14.1)	(40.7)	(45.2)
Retired/Deceased	411	262	56	206	149
% of type	(100.0)	(63.7)	(13.6)	(50.1)	(36.3)
Osteopath**	31	0	0	0	31
% of type	(100.0)	(0.0)	(0.0)	(0.0)	(100.0)
TOTAL	12,175	9358	1425	7933	2817
% of Total	(100.0)	(76.9)	(11.7)	(65.2)	(23.1)

*Non-Use includes:

Deceased	56
Non-deliverable (active)	748
Non-usable (active)	474
Non-usable (training)	147

**Osteopathic physicians were not surveyed.

it should be noted that if the 7303 questionnaire respondents were assumed to constitute a random sample of the 10,691 active cardiologists, the sampling error (standard error for estimating population percentages from sampling percentages) would be less than one-half percent.

Respondents and the Effects of Non-Response

Achieving an 80 percent response rate from the active cardiologists effectively eliminates error attributable to sampling. The question remains: "Are there characteristics attributable to the 20 percent who did not respond which should be taken into account before concluding that the respondents truly represent the total population?" The data provided by the AMA on the entire physician file were examined in comparison to those cardiologists who responded to the survey. Table 2 presents one of the comparisons made for cardiologists by age groups. Differences in the two populations would be expected in either the younger age group (cardiologists still in training or just completing training) and the older age group. From inspection, there are no important differences in the age groups for the entire population and those achieved through respondents to the survey.

Geographical distribution is a factor of considerable importance to the study. To what extent do the respondents actually reflect the distributions for the total population? Table 3 presents the data to assess potential differences. The upper portion of the table gives frequency distributions for all active cardiologists first, as a total of all cardiologists by primary or secondary commitment; second, as percentages within each census division for the active practice cardiologists who responded and those who did not. Comparing the percentages for the two, the Middle Atlantic responded a little below the proportion they represent nationally and the two west divisions responded a little above their national proportions. The differences, however, are very small.

The lower half of the table presents Primary Cardiologists as a total and as respondents and Secondary Cardiologists in the same format. The differences between population and respondents for both Primary and Secondary Cardiologists are negligible.

We conclude from this table and Table 2 that the cardiologists who responded adequately represent the total population of cardiologists at the level of differentiation to be used in the study.

Confidence Associated with the Estimate of 10,691 Active Cardiologists

The totals for active cardiologists (10,691 with 5661 Primary and 5030 Secondary) are accurate within one or two percentage points for a count as of December, 1971. The factors contributing to this assessment are as follows.

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TABLE 2

PARTICIPATING CARDIOLOGISTS BY AGE GROUPS COMPARED TO AMA PHYSICIAN FILE AGE GROUPS

RESPONDING CARDIOLOGISTS	AGE GROUPINGS			TOTAL
	Under 40 Years	40-59 Years	60 and Over	
Usable Returns				
Active Cardiologists	2024	3908	1371	7303
Trainees	398	24	2	424
Non-Usable Returns				
Non-Deliverable	250	233	412	895
Non-Use	129	203	142	474
Retired			206	206
Deceased		10	46	56
Total Respondents	2801	4378	2179	9358
% of Total	(29.9)	(46.8)	(23.3)	(100.0)
AMA Physician File % of Total	3667 (30.2)	5684 (46.8)	2793 (23.0)	12144 (100.0)
Active Respondents with Usable Data % of Total	2024 (27.7)	3908 (53.5)	1371 (18.8)	7303 (100.0)

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TABLE 3

DISTRIBUTION OF NATION'S CARDIOLOGISTS: SPECIALTY BY CENSUS DIVISION

ACTIVITY STATUS AND SPECIALTY		National Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS & APO/FPO	
			New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
All Cardiologists[1]													
Primary		8239	515	1706	1613	167	455	923	290	223	908	69	9
Secondary		3433	403	1368	833	139	314	808	305	145	715	40	20
Total		11,672	918	3074	2446	306	729	1733	595	368	1623	109	29
Less Trainees		979	105	276	172	8	46	185	42	32	106	6	1
All Active Cardiologists[1]	N	10,693	813	2898	1773	318	683	1538	557	337	1523	103	28
	%	100.0	7.6	28.0	16.6	3.0	6.4	14.4	5.2	3.2	14.2	1.0	0.3
Respondents[2]	N	7103	582	1845	1218	231	476	1046	387	234	1075	66	18
	%	100.0	7.8	26.0	16.8	3.0	6.6	14.3	5.4	3.5	14.7	0.8	0.2
Primary Active Cardiologists[1]	N	5661	462	1570	919	161	376	796	273	189	827	65	5
	%	100.0	8.2	27.7	16.2	2.8	6.7	14.1	4.8	3.5	14.6	1.1	0.1
Respondents[2]	N	3912	331	1030	632	126	276	553	201	158	709	41	5
	%	100.0	8.2	26.3	16.3	3.2	6.9	14.9	5.1	4.0	14.8	1.1	0.1
Secondary Active Cardiologists[1]	N	5032	371	1028	854	155	304	742	284	130	696	38	20
	%	100.0	7.4	20.4	17.0	3.1	6.0	14.8	5.6	2.7	13.8	0.8	0.4
Respondents[2]	N	3341	248	681	578	107	205	453	186	96	466	23	13
	%	100.0	7.5	20.8	17.3	3.2	6.1	14.8	5.6	2.9	14.1	0.7	0.4

---

[1] Includes respondent and non-respondent distributions as a composite.

[2] Useable returns from Intersoc Cardiology Survey.

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- The AMA data were accurate within three or four percent with differences primarily in the classification of practice status for the young cardiologist or the old cardiologist.

- Analysis of cardiologist distributions based on the Initial Cardiology Survey data and the AMA data indicated 875 cardiologists in training. The survey to training program directors (discussed as Phase Five) identified 970 in training at this same time period.

- A total of 14 cardiologists were reported as deceased. This could be off by as much as 100 percent and still result in a difference of only 14.

- Those who actually are retired might be more numerous than reported. About 55 percent of those over 65 responded. Assuming that one-fourth of those who did not respond should be classified inactive, the over-estimate due to this factor would still be only about 100.

- The cumulative effect of the most extreme possible error to consider is about 150 too many in the active classification category. This amounts to an error of less than 2 percent.

Table 3 provided frequency distribution data for all cardiologists by Primary and Secondary Cardiologist in various combinations. It is a basic table used in the Advisory Committee discussion of manpower and provided the base for subsequent selection of cardiologists for specific studies.

It is extremely important to keep this table in context. The distributions are pertinent only for the time period when the data were obtained. Projections from this basic table must take the lapsed time interval between December, 1971 and the projected date into account. Changes in total numbers, in proportions of Primary and Secondary Cardiologists and in actual age composition will occur with the passage of time. The relative proportion of younger cardiologists entering their active practices and those leaving active practice will alter the age distributions. The concluding section in this chapter discusses projection factors and provides an estimate of the number of active cardiologists at year-end 1973.

PHASE THREE: LOG-DIARY STUDY OF PROFESSIONAL ACTIVITIES - CARDIOLOGY PROFESSIONAL DIARY

General conceptual design for this study was initiated in parallel to similar activities for the Initial Cardiology Survey. A log-diary of professional activities was an integral study phase in all project planning.

The log-diary was designed to obtain:

- precise measures of time committed to professional activities described in the cardiologist's own words

- precise measures of time devoted to each patient encounter and to teaching and research as they occur

- essential data to generate patient profiles which by (1) their reported frequency or (2) the methods employed in patient management associated with patient problems, might suggest potential training areas

- measurement of the extent to which the cardiologist is practicing as a specialist or generalist through analysis of the patient statistics regarding clinical problems, setting and time

- comprehensive statistics (by type of cardiologist) on the incidence of cardiac and non-cardiac disorders within practices for those physicians classified as cardiologists

- indices of types of teaching and research activity for types of cardiologists

- information to validate data obtained through the Annual Certification Survey.

Survey Instrument

The instrument in use demonstrated the feasibility of having physicians with large patient-load practices keep (1) detailed records regarding each significant event which occurred during a professional day and (2) very detailed information of a diagnostic, treatment, and management nature. With the exception of the "Activity Summary" section - a general activity summary section for recording all types of professional activities - all significant data regarding the various patient encounters were recorded in number form by selecting from a set of classification categories. Similar specificity was obtained regarding the physician's teaching and research activities.

The 133 participating physicians recorded more than 13,000 patient encounters over a five-day period. It is believed that the detailed level of recording was due to the logical structure of the survey form, organized in five sections, with each section in the sequence which was most likely to apply to each participant. Furthermore, the sections were color coded and of increasing page width so that the physician could easily move from one section to another, depending on his recording needs. The entire log-sheet was limited to a size which fit conveniently in a man's suit pocket (or white lab coat) so that it could be carried easily. The recording categories were carefully developed by COCAP's advisory committee and tested in a variety of field practice situations before the forms were actually considered satisfactory.

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FIGURE 7

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

CLINICAL TESTS

CODING KEY:

1. ACTIVITY TIME – New time sequence for each patient.
2. PATIENT DESCRIPTORS – An abbreviated set is all that is needed since the patient will appear in the PATIENT CARE section in most instances. Data obtained from patient's chart. Nurse or assistant may record.
3. LABORATORY AND TESTING – Make an entry for each test performed. If a test or procedure was used and is not on the list, DESCRIBE IN COLUMN 17 and then record.
4. YOUR INVOLVEMENT – For each test performed, indicate whether you (A) *ordered* it; (B) *performed* it and/or (C) *interpreted* it. You will probably use more than one letter with each test.

LABORATORY AND DIAGNOSTIC TESTING PROCEDURES

1. Electrocardiogram
2. Vectorcardiogram
3. Phonocardiogram
4. Echo, apex or other non-invasive techniques
5. Exercise testing
6. Cardiac fluoroscopy
7. Chest X-ray
8. Right and/or left heart catheterization
9. Right and/or left heart catheterization with angiogram
10. Flotation catheterization
11. Selective coronary arteriogram
12. Pulmonary angiogram
13. Non-coronary arteriogram
14. His bundle recording
15. Pacemaker insertion
16. Pacemaker evaluation
17. OTHER: Specify and record ______________

____

USE TO RECORD CLINICAL TEST ORDERED, PERFORMED AND INTERPRETED

DATE:

RECORD ALL TESTS PERFORMED IN NUMBERED COLUMNS
Refer to *numbered list* on *opposite page*

FOR EACH TEST PERFORMED, indicate whether you
A - ORDERED it; B - PERFORMED it; C - INTERPRETED it

LABORATORY & DIAGNOSTIC TESTING

TIME for ACTIVITY		PATIENT DESCRIPTORS																				
BEGIN	END	AGE	SEX M/F	ETHNIC W B Other	Own/Refer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

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FIGURE 8

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

RESEARCH

USE TO RECORD AND DESCRIBE YOUR RESEARCH

DATE:				CHECK AND RECORD FOR ALL APPLICABLE CATEGORIES					
				Involving	Location	Utilizing	Your Role		Team
	TIME for ACTIVITY Begin	End	RESEARCH PROBLEM *Brief descriptive statement* (Amplify on opposite page if more space is needed)	Human Animal Other	Lab Bedside ER/OR Office	Drugs Prosthetic Device Equipment	Teaching? YES or NO	Observe Participate Direct	Team? YES/NO If YES, *NUMBER* of Co-Investigators
RESEARCH									

FIGURE 9

SAMPLE PAGE FROM CARDIOLOGY PROFESSIONAL DIARY

TEACHING

USE TO RECORD AND DESCRIBE YOUR TEACHING

DATE:		TEACHING LEVEL and NUMBER TAUGHT						SETTING Record all used		METHODS		ROLE	TOPIC
TIME for ACTIVITY													Describe in a phrase
Begin	End	Med Student	House Staff	Post Graduate	Nursing	Paramedical	Community (non-medical)	Class Room Lecture Hall Conference Office	Bedside ER/OR Lab	Audio-Visuals YES or NO	Examinations YES or NO	CONDUCT or OBSERVE	

TEACHING

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differed sufficiently to justify identification and independent analysis. While USC DRME and the ACC Advisory Committee were fully cognizant of the fact that the specializations within cardiological practice extend well beyond the four groupings selected, it was agreed that these groups would supply sufficient information to meet the major objectives for this study stage. The four types of cardiologists identified for this log-diary study were:

1. Primary Cardiologists in a non-institutional practice setting (approximately 37 percent of the study population);
2. Secondary Cardiologists in a non-institutional practice setting (approximately 41 percent of the study population);
3. Primary Cardiologists in an institutional practice setting (approximately 16 percent of the study population);
4. Secondary Cardiologists in an institutional practice setting (approximately 6 percent of the study population).

The non-institutional practice includes those practice arrangements which traditionally are described as "solo," "group," and "partnership." It is recognized that the concept of "corporation" is omitted in this classification and that the difference between "partnership" and "group" is a relatively obscure one - particularly when the numbers of individuals involved in the arrangement are small. However, initial data did not show significant differences in activity profiles among these groups and they were combined on that basis.

The institutional practice includes hospital and "hospital-like" arrangements and employment by medical schools. It does not include individuals whose employment is with federal agencies (e.g., NIH, VA); nor does it include comparable employment arrangements on the state, county or municipal level.

Sampling Population

The population for the diary sample consisted of the non-federal respondents to the first mailing of the Initial Cardiology Survey. The decision to limit the sampling population to this group was reached after extensive comparisons between response groups revealed no important differences attributable to whether they responded to the first, second, or third mailing. A controllable difference would be the numbers of Primary or Secondary Cardiologists responding since this was one of the stratification criteria used in describing the four groups to study. A non-controllable difference would be associated with proportion of time to activities, proportion of patients in a referral status - any factor which was not part of the stratification plan. Analyses were run to provide comparative statistics on the two respondent groups used in reaching the conclusion that there were no important differences attributable to when they responded. Analyses were made to compare the Cardiology Professional Diary sampling strata with the total responding population to the Initial Cardiology Survey. The differences between the two groups are negligible as they relate to geographical location, patient distance to care, practice arrangements, size of medical service community and proportion of time given to summarized professional activities. The groups used for the Cardiology Professional Diary study has a little more time in cardiological activities, received more referral patients and had more members who are board certified, Certified in Cardiology and/or members of the ACC. With the exception of board certified cardiologists where 10 percent more have this status, the differences cited are all less than 5 percent. As a profile, the differences might suggest a slightly better "qualified" group of cardiologists than those who were not included but even the areas where the difference is greatest had no apparent effect on the activities which cardiologists perform.

The reasons for using the first respondents as the sampling population, once it was determined that no important bias would result from the action, were (1) the motivation of participants and (2) the fact that the first study was not completed at the time the log-diary study had to begin. Motivation was important because the log-diary was a complex time-consuming instrument. Knowing the complexity of the instrument, it was only logical to work with a respondent group who had willingly participated previously - as long as doing so would not bias the results. Cardiologists who responded to the Initial Cardiology Survey only after a second or third mailing were questionable potential respondents to this longer survey instrument.

Sampling Plan

The basis of the sampling plan was the desirability, expressed by all groups involved in the study through Advisory Committee action, of obtaining separate statistical estimates within reasonable error margins for each of the four cardiologist types described previously.

The log-diary population consisted of 3,266 active cardiologists who responded to the Cardiology Survey during the first response period. The four cardiologist types were treated as separate populations (major strata) as follows:

1. Primary Cardiologist, Non-Institutional Employment (N=1295)
2. Primary Cardiologist, Institutional Employment (N= 530)
3. Secondary Cardiologist, Non-Institutional Employment (N=1192)

4. Secondary Cardiologist, Institutional Employment (N= 107)

Other (not included) (N= 142)

"Other" includes a wide array of non-patient care and non-research or teaching roles such as working with pharmaceutical houses, insurance firms, law firms, and the like. Exclusion of "Other" reduced the log-diary population to 3,134.

Each of these major strata was sampled according to the following rationale. The confidence interval for an obtained sample percentage of 50 percent was set at ± 5 percent (68 percent confidence level). Since confidence intervals are a maximum for sample percentages of 50 percent, actual confidence intervals were anticipated to be somewhat narrower. The basic relationship involved in determining the required sample size for each stratum is expressed in the equation below.

$$CI = P \pm Z \sqrt{\frac{p(1-p)}{n}\left[1-\frac{n}{N}\right]}$$

CI = Confidence Interval

P = value of the sampled proportion

n = sample size

N = size of the stratum or population

Z = the normal deviation associated with the desired probability level (Z=1 for a probability of 68 percent, Z=1.96 for a probability of 95 percent)

Given the above constraints on the Confidence Interval, sample sizes for the strata can be determined by this formula:

$$n = \frac{100N}{N+100} \quad \frac{1}{R} \quad \text{(R is rate of return)}$$

Sample sizes are shown for the four log-diary strata in Table 4.

The actual sample was based on the conservative possibility of a return rate as low as 50 percent. This was set because of the known difficulty participants would have in maintaining the log-diary, the time involved in keeping it, and the introduction of the survey instrument by mail rather than personal contact.

TABLE 6

SAMPLE SIZES REQUIRED FOR STANDARD ERROR
OF FIVE PERCENT[a]

Specialty/Practice Type	N	Assuming Usable Returns At:			Actual Sample[b]
		100%	75%	50%	
Primary Non-Institutional	1205	93	124	186	282
Primary Institutional	530	84	112	168	271
Secondary Non-Institutional	1182	92	123	184	287
Secondary Institutional	107	52	69	104	106

[a] For sample percentages of 50 percent

[b] Sample augmented to ensure representation from all states

In addition to the stratification variables, some concern was raised about the representativeness of the samples with respect to geographic and population variables. Therefore, each stratum was divided into [illegible] cells created by combining [illegible] geographic regions and four community sizes, and then sampled proportionately according to the size of the cells within the stratum.

Differences in the data obtained from the [illegible] cells were not anticipated, and in addition, sampling error for these cells was uncontrolled. For these reasons, no statistical estimates were planned with respect to geographic region or community size. The proportional sampling, however, could result in a reduction of sampling error for the major strata.

Each of the [illegible] cells was sampled by the sampling fraction used for the major strata ([illegible], [illegible], [illegible] and [illegible] respectively). However, certain adjacent small cells were collapsed based on [illegible] [illegible] [illegible], [illegible], [illegible] and [illegible] cells result. The strata were collapsed to four types of participants, four community sizes and [illegible] census divisions for analyses.

Participation Rate

The actual rate of return, based on usable returns, was [illegible] percent (based on total returns the rate was [illegible] percent), as shown in Table [illegible]. Primary Participants responded at a [illegible] percent rate, compared with [illegible] percent for Secondary Participants. A somewhat higher willingness to respond on the part of the Primary Participants is also indicated in Table [illegible] by the higher percentage of this group in the [illegible] [illegible] [illegible] in the four sections than in the total respondent group.

The distribution of usable returns among the four strata was, of course, purposely skewed according to the sampling plan. By applying the weights shown in column [illegible] of Table [illegible], the strata are reweighted in accordance with the distribution in the total respondent group.

Table [illegible] compares the total respondent population, sampling population, sample and sample returns on the basis of census division, the only deviation being an under representation of the Middle Atlantic region in the [illegible] returns relative to the sample and sampling populations. Table [illegible] compares the sample and the sample returns in a cross-tabulation of strata by census division.

Sampling Error Expected in Study Data

As previously discussed, samples were drawn from each of the four strata so that the standard error for estimating percentages within each stratum would be a maximum of [illegible] percent under the most conservative assumptions. Actual errors could be anticipated to be somewhat lower.

[illegible]

[illegible]

Specialty/Practice Type	[illegible]		[illegible]		[illegible]	[illegible]		[illegible]	[illegible]
	N	%	N	%	N	N	%	%	
Primary:									
Non-Institutional	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Institutional	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Secondary:									
Non-Institutional	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Institutional	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

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		[illegible]		[illegible]			[illegible]		[illegible]			
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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5. To obtain his assessment of manpower adequacy for both Primary and Secondary Cardiologists in his particular geographic area.

Study Instrument

The eleven- page questionnaire design permitted either recording of factual data (e.g., "where received residency training and number or years in training") or checking of a response choice most closely approaching the statement which would have been made had the question been open-ended. This procedure simplified the respondent's tasks and provided the project staff with uniform response data. The first three sections focused on characteristics of the cardiologist's current practice and his training for practice. The fourth section asked about continuing education - frequencey of participation and recommendations for programs. The fifth section asked for an assessment of manpower adequacy. The final section invited narrative recommendations in either manpower or training areas.

Field testing occurred in the Los Angeles area. Cardiologists whose ages and practices were representative of those to whom the instrument would be sent participated in this test. The final instrument reflected their recommendations as well as some provided by the Advisory Committee and NHLI.

The development of the questionnaire extended over about one calendar year, during which time it was an agenda item for each of the Advisory Committee's meetings. Initially the plan had been to obtain information regarding functions and responsibilities of support staffs and similar organizational questions; these were omitted by the Committee who deemed it more important to obtain a comparatively detailed assessment of the parameters of individual's training and assessment of what ought to be offered for each type of training. The actual survey instrument follows and is referenced as Figure 10.

Study Strata

Analysis of the Initial Cardiology Survey data suggested that some differences in the training area might be associated with their age and with age-related measures. The Committee was particularly interested in the training received by cardiologists whose ages were less than 40, although they had an interest in the training experiences of older cardiologists as well. It was believed that the younger cardiologists' assessments of training programs would be much more appropriate than those of the older cardiologists' because substantive changes in formal cardiovascular training have occurred during the past ten years. Because of the special importance of young cardiologists in assessing training program adequacy, the sampling plan was designed to obtain more participants from this age group.

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App Exp 12/31/73

FIGURE 10

AMERICAN COLLEGE OF CARDIOLOGY
9650 ROCKVILLE PIKE BETHESDA, MARYLAND 20014 PHONE: 301 530-1600

ADVISORY COMMITTEE ON CARDIOLOGY TRAINING
AND MANPOWER REQUIREMENTS

COMMITTEE:
FORREST H. ADAMS, M.D.
Chairman
Los Angeles, California
WALTER H. ABELMANN, M.D.
Association of
University Cardiologists
Boston, Massachusetts
NOBLE O. FOWLER, M.D.
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Cardiovascular Disease
Cincinnati, Ohio
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Chest Physicians
Cleveland, Ohio
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Council on Clinical Cardiology
American Heart Association
Cleveland, Ohio
H. J. C. SWAN, M.D.
American College of Cardiology
Los Angeles, California

STEPHEN ABRAHAMSON, PH.D.
Project Director
University of Southern California
Los Angeles, California

CARDIOLOGIST'S TRAINING SURVEY

SAMPLE LABEL

00000-XX-0-0000

John A. Doe, M.D.
Anytown, U.S.A.

Your participation is vitally important. If you have any questions please call our Associate Project Director, R. C. Mendenhall, at (213) 225-1511, extension 349, collect.

Please return your completed form to our Cardiology Manpower Study Project, University of Southern California School of Medicine, Division of Research in Medical Education in the self-addressed stamped envelope which accompanied the survey. If you misplaced it, the address is 2025 Zonal Avenue, Los Angeles, California 90033.

FIGURE 10A

I. CHARACTERISTICS OF YOUR PRACTICE

Cardiologists's practices vary widely both in the amount of time actually devoted to cardiovascular matters and the activities which they perform or supervise. The list below is representative of the range of activities within practices.

PLEASE CHECK WHETHER OR NOT YOU PERFORM OR ENGAGE IN THE ACTIVITIES LISTED. FOR THOSE CHECKED *YES*, ALSO CHECK THE BOX WHICH MOST CLOSELY DESCRIBES HOW OFTEN YOU DO THE ACTIVITY.

	For each CHECK		If YES, how often? CHECK ONE			
Professional Activity	Yes	No	Daily	Weekly	Monthly	Occasionally
CLINICAL:	√	√	√	√	√	√
Treat patients with cardiac disease classified as						
Coronary	☐	☐	☐	☐	☐	☐
Hypertensive	☐	☐	☐	☐	☐	☐
Rheumatic	☐	☐	☐	☐	☐	☐
Congenital	☐	☐	☐	☐	☐	☐
Cardiomyopathy	☐	☐	☐	☐	☐	☐
Peripheral Vascular Disease	☐	☐	☐	☐	☐	☐
See pediatric patients with cardiac disease	☐	☐	☐	☐	☐	☐
Perform as a consultant on cardiac problems	☐	☐	☐	☐	☐	☐
Manage an intensive care and/or coronary care facility	☐	☐	☐	☐	☐	☐
Serve as a cardiologist on a CCU committee	☐	☐	☐	☐	☐	☐
Perform exercise stress testing	☐	☐	☐	☐	☐	☐
Perform or interpret ECGs	☐	☐	☐	☐	☐	☐
Perform or interpret VCGs	☐	☐	☐	☐	☐	☐
Perform or interpret angiograms (cardiac, coronary or peripheral)	☐	☐	☐	☐	☐	☐
Perform or interpret echocardiograms	☐	☐	☐	☐	☐	☐
Perform or interpret cardiac fluoroscopies	☐	☐	☐	☐	☐	☐
Conduct diagnostic cardiac catheterizations	☐	☐	☐	☐	☐	☐
Direct a hemodynamics laboratory	☐	☐	☐	☐	☐	☐

continued

FIGURE 10B

I. CHARACTERISTICS OF YOUR PRACTICE (Continued)

Professional Activity	For each CHECK		If YES, how often? CHECK ONE			
	Yes	No	Daily	Weekly	Monthly	Occasionally
	☑	☑	☑	☑	☑	☑
RESEARCH:						
Conduct clinical research	☐	☐	☐	☐	☐	☐
Conduct basic laboratory research	☐	☐	☐	☐	☐	☐
TEACHING:						
Teach nursing staff on clinical rounds or classroom	☐	☐	☐	☐	☐	☐
Teach medical students, interns, residents and/or fellows in clinical and laboratory settings	☐	☐	☐	☐	☐	☐
Teach medical students, interns, residents and/or fellows in formal classroom settings	☐	☐	☐	☐	☐	☐
Teach others to perform cardiac diagnostic x-ray procedures	☐	☐	☐	☐	☐	☐
Teach others to perform cardiac catheterizations	☐	☐	☐	☐	☐	☐
Teach other diagnostic techniques: ECG, VCG, etc.	☐	☐	☐	☐	☐	☐
Participate in professional seminars, workshops and symposia as a consultant cardiologist	☐	☐	☐	☐	☐	☐

II. YOUR TYPE OF PRACTICE

A year ago, we asked you questions about the amount of time which you devote to different activities and the employment arrangements for your practice. *We need a current summary of (a) your involvement in cardiology and (b) your practice arrangement.* PLEASE CHECK THE STATEMENTS BELOW WHICH BEST DESCRIBE YOUR PRACTICE.

	Check Best Descriptors
1. My practice is:	☑
Primarily in cardiology (over 50 percent time)	☐
Secondarily in cardiology (under 50 percent time)	☐
2. My practice arrangements are predominantly:	
Non-Institutional (Solo, Group, Partnership)	☐
Institutional (Medical School, Hospital)	☐

FIGURE 10C

III. YOUR TRAINING IN CARDIOVASCULAR DISEASES, ITS ADEQUACY AND YOUR RECOMMENDATIONS FOR THE TRAINING OF OTHER CARDIOLOGISTS

CHECK ONE
Yes No

1. How many years of post-doctoral clinical training did you have before entering your own continuous practice? ____________ (years) ☑ ☑
2. Are you board certified in internal medicine? ☐ ☐
3. Are you board certified in a specialty other than internal medicine? ☐ ☐
   If yes, certified in ______________________________ (describe)
4. Are you subspecialty board certified in cardiovascular disease? ☐ ☐

5. Please indicate the types, dates and locations for your post-doctoral training:

Type of Training	Year(s)	Institution	Institution City
Internship	________	________	________ ________
Residency Internal Medicine	________	________	________
Other (name): ________	________	________	________ ________
Fellow in Cardiology*	________	________	________ ________

*At Least one year of full-time training

FIGURE 10D

6. *Your formal cardiovascular disease training and recommendations:*
We need to know what training you received during residency and/or fellowship in cardiovascular disease and in your judgment its adequacy for your practice. Both aspects — what you received and its value to you in your practice — are extremely important.

As well as assessing your own training, please do so for someone now in training for cardiovascular diseases who might enter a practice similar to yours today. *Please rate the training areas for your type of practice in importance: low, medium, or high.*

CARDIOVASCULAR TRAINING PROGRAM EXPERIENCES AND TRAINING TOPICS	CHECK	CHECK ONE This Training was:			CHECK ONE Importance for Training Others:		
	My Training Included	Too Limited	About Right	Too Much	Low	Med.	High
A. *Experience in Clinical Care, Research and Teaching*	√	√	√	√	√	√	√
Cardiac patient care:	▨	▨	▨	▨	▨	▨	▨
Pediatric							
Medical							
Surgical							
Coronary Care Unit							
Pacemaker insertion							
Pacemaker follow-up							
Cardiovascular research:	▨	▨	▨	▨	▨	▨	▨
Basic							
Clinical							
Teaching:	▨	▨	▨	▨	▨	▨	▨
Clinical							
Didactic							
B. *Laboratory Diagnostic Techniques*	▨	▨	▨	▨	▨	▨	▨
Electrocardiography							
Phonocardiography							
Echocardiography							
Exercise tolerance testing							
Vectorcardiography							

continued

FIGURE 10C

CARDIOVASCULAR TRAINING PROGRAM EXPERIENCES AND TRAINING TOPICS	CHECK	CHECK ONE			CHECK ONE		
		This Training was:			Importance for Training Others		
	No Training Included	Too Limited	About Right	Too Much	Low	Med	High
	✓	✓	✓	✓	✓	✓	✓
B. *Laboratory Diagnostic Techniques (continued)*							
Angiography:							
Cardiac							
Coronary							
Peripheral							
Cardiac catheterization							
Swan-Ganz right heart catheterization							
C. *Laboratory and Classroom Instruction*							
CV anatomy							
CV physiology							
CV biochemistry							
CV pathology							
CV epidemiology							
CV pharmacology							
CV radiology							
Pulmonary physiology							
Hypertensive renal disease							
Peripheral vascular disease							
Cerebral vascular disease							
Biostatistics							
Bioengineering							

FIGURE [illegible]

IV. CONTINUING EDUCATION, ITS ADEQUACY AND RECOMMENDATIONS

1. Your Needs in Continuing Education Programs

As a practicing physician with a significant involvement in cardiovascular patient care, you are in a better position to assess your own needs for further formal training than anyone else. Your assessment is vitally important to us.

For your own training, please check the areas or topics of interest, the length of course desired and how often it should be offered to you.

TYPE OF TRAINING	[illegible]	[illegible]						
		[illegible]				[illegible]		
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A. CLASSROOM INSTRUCTION OR SEMINARS								
General medical cardiology								
CV surgery								
Pediatric cardiology								
CV anatomy								
CV physiology								
CV biochemistry								
CV pathology								
CV epidemiology								
CV pharmacology								
CV radiology								
Pulmonary physiology								
Hypertensive renal disease								
Peripheral vascular disease								
Cerebral vascular disease								
Biostatistics								
Bioengineering								
Electrocardiography								
Phonocardiography								

continued

Continued

TYPE OF TRAINING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Echocardiography								
Doppler ultrasound testing								
Vectorcardiography								
Angiography								
Cardiac catheterization								
B. [illegible]								
Cardiac pacing - use								
Temporary								
Medical								
Surgical								
Coronary Care Unit								
Pacemaker insertion and follow-up								
C. [illegible]								
Electrocardiography								
Phonocardiography								
Echocardiography								
Doppler ultrasound testing								
Vectorcardiography								
Angiography								
Cardiac								
Coronary								
Peripheral								
Cardiac catheterization								
Swan-Ganz right heart catheterization								

[illegible] [illegible]

[illegible]

A. [illegible]

[illegible]

☐ More than once a year
☐ Once a year
☐ Every [illegible] years
☐ Every [illegible] years
☐ Every [illegible] years
☐ Every [illegible] years
☐ Do not participate

B. [illegible]

[illegible]

☐ [illegible]
☐ [illegible]
☐ No opinion

C. [illegible]

[illegible]

☐ More than once a year
☐ Once a year
☐ Every [illegible] years
☐ Every [illegible] years
☐ Every [illegible] years
☐ Every [illegible] years
☐ Do not participate

D. [illegible]

[illegible]

☐ More than once a year
☐ Once a year
☐ Every [illegible] years
☑ Every [illegible] years
☐ Every [illegible] years
☐ Every [illegible] years
☐ Do not participate

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[illegible] [illegible] ______________________________

[illegible] [illegible] [illegible] [illegible] ______________________________

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ______________________________

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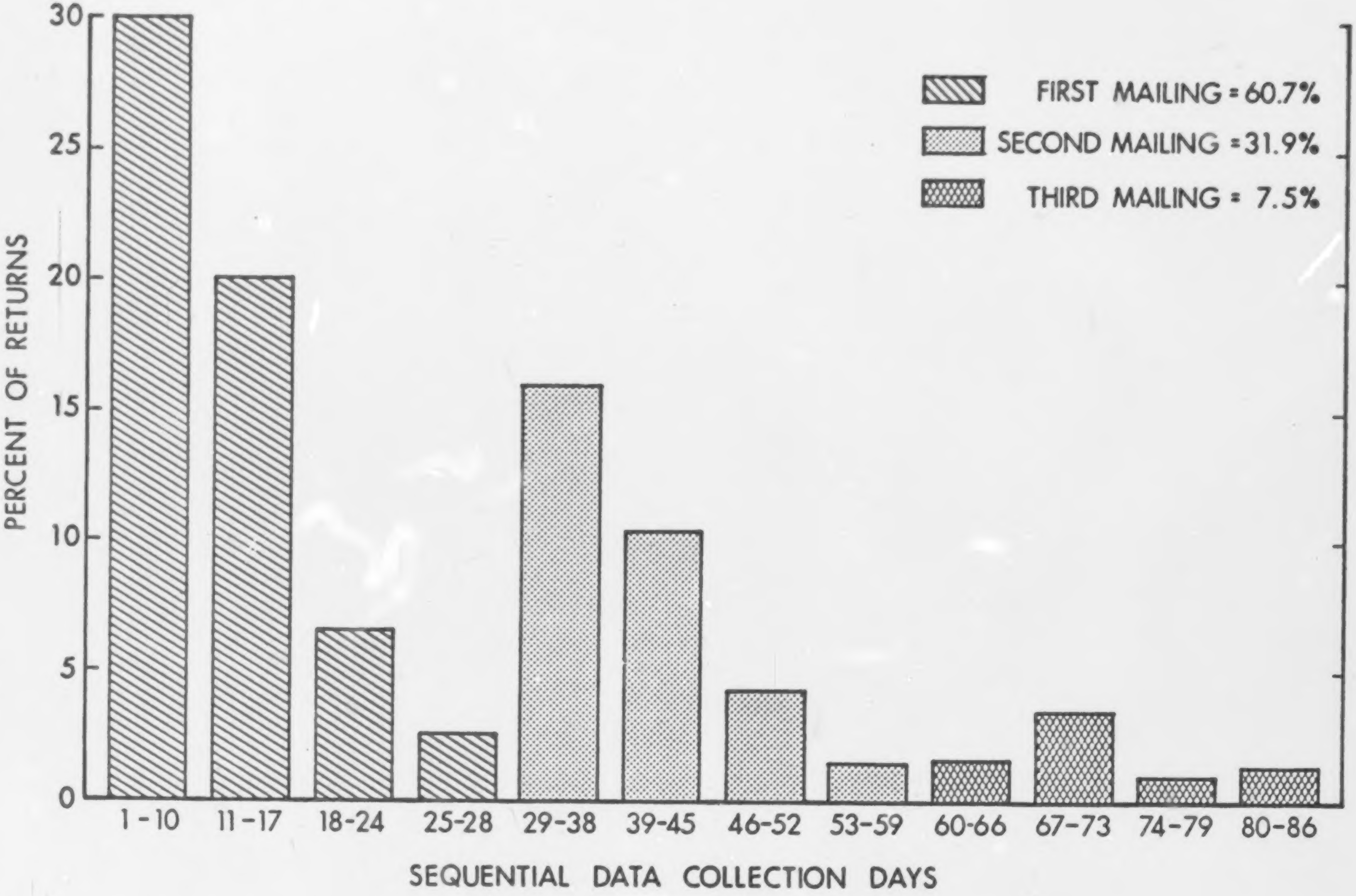
[illegible]	[illegible]				[illegible]
[illegible]	[illegible]				[illegible]

[illegible]
[illegible]

[illegible]

FIGURE 11

CARDIOLOGIST'S TRAINING SURVEY PERCENT OF TOTAL RETURNS
BY SELECTED TIME PERIODS



Survey Respondents

Table 9 presents the distribution for respondents by age and type of cardiologist. It includes percentages received, not usable and actually used in analyses. It is apparent from this table that the Primary Cardiologists responded better than the Secondary Cardiologists. Based on usable returns, and not including cardiology Fellows, the overall rate of return for the training survey was 68.7 percent. As in the diary study, Primary Cardiologists responded at a higher rate (73.2 percent) than Secondardy Cardiologists (63.2 percent). Non-institutional Cardiologists under 40 years of age responded at a somewhat higher rate (72.2 percent) than either Institutional Cardiologists under 40 (66.6 percent), or than Non- institutional Cardiologists 40 years and over (67.6 percent). The analysis of non-respondents which follows provides more complete data on tendencies toward non-response.

The essential sampling objectives were met and in most instances exceeded for each of the eight groups sampled. Weighting, applied to each stratum, adjusts the respondents to reflect the proportion of the total cardiologist population which they represent.

While weighting will put the respondent group in its proper perspective related to other groups, a question emerges concerning the selectivity in respondents which different response rates may indicate. A detailed analysis of respondents compared to non-respondents using Initial Cardiology Survey and AMA biographical data was conducted to determine the potential effects of the non-respondent group. This is reported in detail in Appendix A. Conclusions from that analysis are similar to those reported for the log-diary study.

- Those cardiologists more heavily involved in cardiology (primary) responded better than those with a minor cardiology commitment (secondary). This tendency was greater than a similar tendency noted in the log-diary study, due to the fact that the log-diary population (first wave questionnaire respondents) already contained selectively more cardiology specialists than the study population for the training survey (all questionnaire respondents).

- Younger cardiologists engaged in solo and hospital-based practices responded at a lower rate than those in other practice arrangements.

- No important geographical or population differences were found.

- No important differences related to professional activities were found.

Since stratification for this study was based on (1) primary or secondary cardiologist in (2) non-institutional or institutional practice settings and (3) by age groups, the variability noted is accounted for through the sampling plan except

TABLE 9

CARDIOLOGISTS' TRAINING SURVEY PARTICIPATION RATES: SPECIALTY/PRACTICE TYPE AND AGE GROUPS BY PROPORTIONS WITHIN SAMPLING CATEGORIES

Specialty/Practice Type and Age Groups	Population[a]		Sample[b]		Usable Returns[c]		Return Rate[d]	Adjustment Weight for Sample[e]
	N	%	N	%	N	%	%	
UNDER 40 YEARS								
Primary:								
Non-Institutional	565	(8.0)	373	(17.0)	282	(18.7)	75.6%	.428
Institutional	733	(10.6)	403	(18.4)	288	(19.1)	71.5%	.555
Secondary:								
Non-Institutional	483	(7.0)	354	(16.1)	243	(16.1)	68.6%	.435
Institutional	180	(2.6)	180	(8.2)	100	(6.6)	55.6%	.392
40 AND OVER								
Primary:								
Non-Institutional	1881	(27.1)	250	(11.3)	178	(11.8)	71.2%	2.298
Institutional	614	(8.9)	190	(8.6)	142	(9.4)	74.7%	.946
Secondary:								
Non-Institutional	2174	(31.4)	269	(12.2)	173	(11.4)	64.3%	2.739
Institutional	304	(4.4)	176	(8.0)	103	(6.8)	58.5%	.645
Subtotal	6934	(100.0)	2195	(100.0)	1509	(100.0)	68.7%	
FELLOWS	424		424		234		55.2%	
TOTAL	7358		2619		1743		66.6%	

[a] All private and federal cardiologists responding to initial questionnaire, less those unclassifiable with respect to strata

[b] Sample as described in Table

[c] Does not include 235 non-usable returns

[d] (c) divided by (b)

[e] Weight applied to (c) to achieve percentage distribution comparable to (a)

for the young cardiologist in solo and hospital-based practice. However, deviation from the sample mean in both instances is less than 2 percent.

The relationship of the respondent group to the sample and, in turn, to the total cardiology population is shown in Table 10. Comparing the sample with the participants, the differences are inconsequential. The differences between the sample and the line noted as "Training Population Stratum" are expected since Middle Atlantic has proportionately more older cardiologists and South Atlantic has proportionately more younger cardiologists than other geographic divisions.

Sampling Errors Expected for Cardiologists' Training Survey Data

The sampling plan discussion made the observation that conservative assumptions regarding obtained percentages could be expected to result in standard errors substantially lower than (1) the 5 percent used for cardiologists 60 years old and over; (2) the 3 percent used for cardiologists under age 40. Comparatively lower error rates were achieved in this study than in the log-diary study because of higher response rates in all age groups. The detailed error rates that could be expected for sampled percentages obtained from this survey are presented in Chaper 8. These are summarized in Table 11.

PHASE FIVE: CARDIOLOGY TRAINING PROGRAMS STUDY

This study, addressed to institutions providing full-time cardiovascular training of at least one year duration, consumed more Advisory Committee and DRME Project Staff time in its conception than any of the other study phases. The time was required because (1) there was no existing list of institutions offering the type of training of interest; (2) there were no formally accepted standards for such trining programs; and (3) a compromise related to "desired level of detail" and "likely level of response" was required through each of the iterations of the study design - a problem never fully resolved to all party's satisfaction.

The resultant survey instrument was very complex, one which would readily be answered only by those who attached the same level of importance to it as was given by the investigators. None of the sections called for data which could be easily obtained from a single source; most of them required compilation by the responding individuals.

The objectives may be summarized as follows.

1. Determine the number of cardiovascular training programs, their location, and the affiliations which they have with other institutions.

TABLE 10

CARDIOLOGY TRAINING SURVEY POPULATIONS:
PERCENTAGE (%) DISTRIBUTION BY CENSUS DIVISION WITHIN REGION

Cardiology Study Populations		Northeast		South			North Central		West		Caribbean	Military	National Totals
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific			
All Active Cardiologists	N (%)	603 (7.6)	2058 (26.0)	1773 (16.6)	318 (2.8)	683 (8.4)	1338 (14.4)	557 (5.2)	337 (3.1)	1523 (14.3)	171 (1.8)	28 (0.3)	15,691 (100.0)
Cardiology Survey Respondents	N (%)	580 (7.6)	1966 (26.0)	1219 (16.6)	233 (2.9)	679 (9.0)	1060 (14.3)	397 (5.4)	255 (3.3)	1075 (14.7)	66 (0.9)	18 (0.2)	7,503 (100.0)
Training Population [illegible]	N (%)	551 (7.9)	1832 (26.4)	1162 (16.8)	226 (3.3)	462 (6.7)	988 (14.3)	366 (5.3)	267 (3.8)	1025 (14.7)	61 (0.9)	17 (0.2)	6,934 (100.0)
Training Sample	N (%)	181 (8.3)	523 (23.9)	420 (19.1)	72 (3.3)	146 (6.7)	290 (13.2)	118 (5.4)	75 (3.4)	327 (14.9)	20 (0.9)	14 (0.6)	2,185 (100.0)
Training Participants	N (%)	128 (8.5)	352 (23.3)	287 (19.0)	49 (3.3)	100 (6.6)	211 (14.0)	78 (5.2)	53 (3.5)	228 (15.1)	14 (0.9)	9 (0.6)	1,507 (100.0)

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TABLE 11

CARDIOLOGY PROFESSIONAL DIARY
EXPECTED ERRORS WITH OBTAINED PERCENTAGES

Age Group Less than 40 Years,
Not Including Secondary Institutional[1]

Obtained Sample Percentages	Expected Error
30-70%	2.0-2.5%
15-29%, 71-85%	1.5-2.0%
5-14%, 86-95%	1.0-1.5%
5%, 95%	1.0%

Age Group 40 Years and Over,
Plus Secondary Institutional Under 40 Years[1]

Obtained Sample Percentages	Expected Error
30-70%	3.0-4.0%
15-29%, 71-85%	2.5-3.5%
5-14%, 86-95%	1.5-2.5%
5%, 95%	1.0%

---

[1] Because Secondary Non-institutional Cardiologists responded at a much lower rate than other groups within the younger age classification, errors associated with this group are on the same order of magnitude as in the 40-years-and-over age classification.

For percentages obtained for the weighted composite across strata (all cardiologists) expected errors range from about 1.0 percent in the midrange to less than 0.5 percent at the extremes.

2. Determine the general characteristics of their facilities and services with particular reference to those directly applicable to cardiovascular disease training.

3. Determine the composition of the training program staffs.

4. Determine the qualifications of the training program staff and their relative time commitments to components of the training program.

5. Determine criteria for admission to programs as well as opportunities available for training.

6. Determine the training program director's objectives for the training program: what does he believe his graduates are prepared to do?

7. Determine who is trained by the cardiovascular training program staff with specific indication of required hours in designated topical and experience areas.

8. Determine sources of fiscal support for the training program.

9. Determine perception of adequacy of staff, potential for program expansion, and the number of additional trainees which could be added (1) without staff increase and (2) with staff increase.

10. Determine the type of continuing educational programs sponsored by the institution.

11. Obtain recommendations for cardiovascular training program improvement.

Survey Instrument

The Cardiovascular Training Programs Survey incorporated questions which Advisory Committee members felt were necessary and those of primary interest to the National Heart and Lung Institute. Questions related to types of training experience were obtained from a questionnaire which the Subspecialty Board in Cardiovascular Disease had previously developed for their use in assessing the training experiences of their candidates. The resultant data can be used by the Board as "baseline measures" of training which they consider appropriate, if not required. The questions regarding continuing education reflect the special interest of the American College of Cardiology. Other questions were uniformly interesting to the Advisory Committee, NHLI and the USC Project Staff.

The survey instrument was pretested in the Los Angeles area in institutions the characteristics of which were similar to the anticipated range of institutions to be contacted.

Upon completion of the field test, the conclusion was that the questions were clear and that they could be answered, but that answering them would require very positive interest in the study on the part of those to whom it was addressed. The Cardiovascular Training Program Survey form is identified as Figure 11.

Study Population

The population was defined from a listing provided by the AMA of all institutions with approved residencies in Internal Medicine. From this list of [illegible] hospitals and other agencies, it was expected that the institutions providing the "cardiovascular training of at least one year's duration" could be identified. While it was possible that this list might not encompass the study universe, the likelihood of important omissions was considered remote. The [illegible] target institutions include [illegible] hospitals and another [illegible] which had training programs which met the study criteria.

Field Study Methods

There were two study objectives which influenced the methods for data acquisition: the first, to obtain an accurate count of all cardiovascular training programs and their current number of trainees; the second, to obtain complete responses from as many institutions as possible.

The survey form was mailed to all [illegible] potentially eligible institutions. Non-responding institutions were contacted by telephone and their Chief of Medicine and/or Chief of Cardiology was asked whether or not he had a program. If he had one, he was asked how many trainees were currently participants in that program.

Characteristics of the Responding and Non-Responding Institutions

Response and non-response analyses are extremely difficult to make in this instance because so few facts are known about those institutions which did not respond. The number of training institutions, number of internal medicine residency positions and the number of trainees at the institutions constitute all that is known about each of the [illegible] programs. Any conclusions which are made pertaining to the total population of [illegible] other than those just noted must necessarily assume that either the non-respondents are identical to the respondents or that they differ in only minor factors. The available data which apply to all training institutions suggest only minor differences between respondents and non-respondents.

[illegible]

[illegible]

AMERICAN COLLEGE OF CARDIOLOGY

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Department of Internal Medicine

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible] [illegible] ☐ [illegible] ☐ [illegible] ☐

[illegible] [illegible] ☐ [illegible] ☐

[illegible]

[illegible] [illegible]

1. ______________________ ______________________
2. ______________________ ______________________
3. ______________________ ______________________
4. ______________________ ______________________

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

FIGURE 12F

10. Program directors and their institutions have different objectives for their cardiovascular training programs. *Please check all of the following:*

Upon completion of our program, the majority of our trainees are able to:

	Yes	No
Manage an intensive care and/or coronary care facility	☐	☐
Conduct diagnostic cardiac catheterizations	☐	☐
Direct a hemodynamics lab	☐	☐
Serve as cardiologist consultant on a CCU committee	☐	☐
Perform as a cardiologist consultant in all clinical areas	☐	☐
Conduct clinical research	☐	☐
Conduct basic laboratory research	☐	☐
Teach graduate students and residents in clinical and laboratory settings	☐	☐
Teach medical students, residents and fellows in both clinical and formal classroom settings	☐	☐
Participate in professional seminars, workshops and symposia as consultant cardiologists	☐	☐
Are eligible for subspecialty board certification in cardiovascular diseases	☐	☐
Perform and teach others to perform cardiac diagnostic x-ray procedures	☐	☐
Perform and teach others to perform non-invasive laboratory techniques such as . . . (list)		
______________________________	☐	☐
______________________________	☐	☐
______________________________	☐	☐
______________________________	☐	☐

FIGURE 12G

IV. TRAINING PROGRAM SUPPORT

Please note the number of grants from the agencies indicated and the total dollar support they provide to the cardiovascular training program.

Type of Support	Number	Dollars (total amount for each category)
1. Training grants and fellowships		
Federal Government Agency		
NHLI	____	____
Other NIH	____	____
Other	____	____
Non-Federal Government Agency	____	____
Non-Government Agency	____	____
AHA	____	____
Local Heart Association	____	____
Foundation	____	____
Other	____	____
2. Research grants contributing to the cardiovascular training program. (Record dollars for only the training portion.)		
Federal Government Agency		
NHLI	____	____
Other NIH	____	____
Other	____	____
Non-Federal Government Agency	____	____
Non-Government Agency		
AHA	____	____
Local Heart Association	____	____
Foundation	____	____
Other	____	____
3. Own institution funds, including fees from patients, etc. (Do not include any government support.)	____	____

V. POTENTIAL FOR EXPANSION OF YOUR PROGRAM

1. Given present staff and resources, could you take additional trainees in your current cardiovascular program? If yes, please record how many could be added to the program years enumerated below.

Program Year	Number we could add
1	____
2	____
3	____

2. Do you have staff positions which are budgeted currently unfilled in the cardiovascular division?

Yes ☐ No ☐

If yes, how many? ____________

3. Given your present training load, how many additional staff positions would you consider currently desirable in the cardiovascular division to provide for optimal teaching and research.

____

4. Please estimate the percentage increase from your present level in your cardiovascular training load (number of pre- and post-doctoral students and trainees) which you might expect in five years time.

____________%

Given this increase in training load, what number of additional staff positions would you consider desirable for the cardiovascular division in five years time in order to provide for optimal teaching and research?

____

FIGURE 12H

VI. CONTINUING EDUCATION COURSES AT YOUR INSTITUTION

1. Does your institution offer continuing education courses to physicians in the cardiovascular field? [Included should be circumscribed courses of one full day as a minimum, or extended courses of at least one hour per week.] (CHECK ONE)

Yes __________ No ____________

If you answered yes, what percent per year are given for physicians

a. In the local area __________________ b. At the national level ________________

2. For the courses which you offer, we need to know the number offered and the number of participants by three types for the past three years. The types are noted below. *If these data are not readily available in all instances, simply complete those portions which you can.*

Courses by Type	1970		1971		1972	
	Number of courses	Number of Participants	Number of courses	Number of Participants	Number of courses	Number of Participants
Less than two weeks - full-time						
More than two weeks - full-time						
Extended - at least one hour per week for 3 months or more						

3. Please indicate the numbers of courses in their general subject areas for the total three years.

	Number
General Medical Cardiology	____________
CV Physiology	____________
CV Surgery	____________
CV Pharmacology	____________
CV Radiology	____________
CV Pathology	____________
Other (list):	
______________________	____________
______________________	____________
______________________	____________
______________________	____________
______________________	____________

FIGURE 12I

VII. RECOMMENDATIONS REGARDING PROGRAM IMPROVEMENTS

We would appreciate receiving your comments about how cardiovascular training programs could or should be improved in order to provide optimal training experiences. These might concern curriculum, facilities, staff or any other aspect of a training program.

Regarding formal initial cardiovascular training:

FIGURE 12J

Regarding continuing education for physicians:

Internal Medicine Residencies

Table 12 compares the non-respondents to the respondents on a program size measure constructed from grouping internal medicine residencies by (1) lower quartile, (2) two mid-quartiles and (3) upper quartile. From this table it appears that there are no important differences in response patterns attributable to size of internal medicine training programs. These groupings are referred to in Chapters 5 and 8 as Type I, Type II and Type III programs. The differences in size of internal medicine residency programs between the questionnaire respondents and non-respondents are minimal.

Number of Cardiology Trainees

The 190 responding programs have 760 trainees for an average of 4.0 per institution. The 139 non-responding program institutions have 518 trainees for an average of 3.7 per institution. The average number of trainees for all program institutions is 3.9. An estimate of trainees based on the 190 questionnaire respondents and their mean number of trainees would suggest 1,316 trainees for all programs rather than 1,278 as obtained through the questionnaire survey and telephone survey. The estimating error would be about 3 percent, indicating the programs among the non-respondents were slightly smaller. Figure 13 presents a distribution for trainees by programs responding to the survey and those declining to participate.

Training Program Configurations

The 329 programs are describable in terms of the training arrangements which they have with other training institutions. These configurations range from institutions which are totally self-contained (provide all of the training and have no affiliations) to institutions which provide some portion of the training and hence are "satellites" of a parent institution. Three categories of "primary" and one of "secondary" were identified in this study. They are:

1. Primary Training Program. A training program with at least one cardiovascular trainee position which is independent of any other program:

    a. lists no affiliations or dependent programs; or

    b. lists affiliations of a staff exchange character with other primary programs and/or medical schools; or

    c. lists at least one dependent (secondary) program and may or may not show an affiliation with other primary programs.

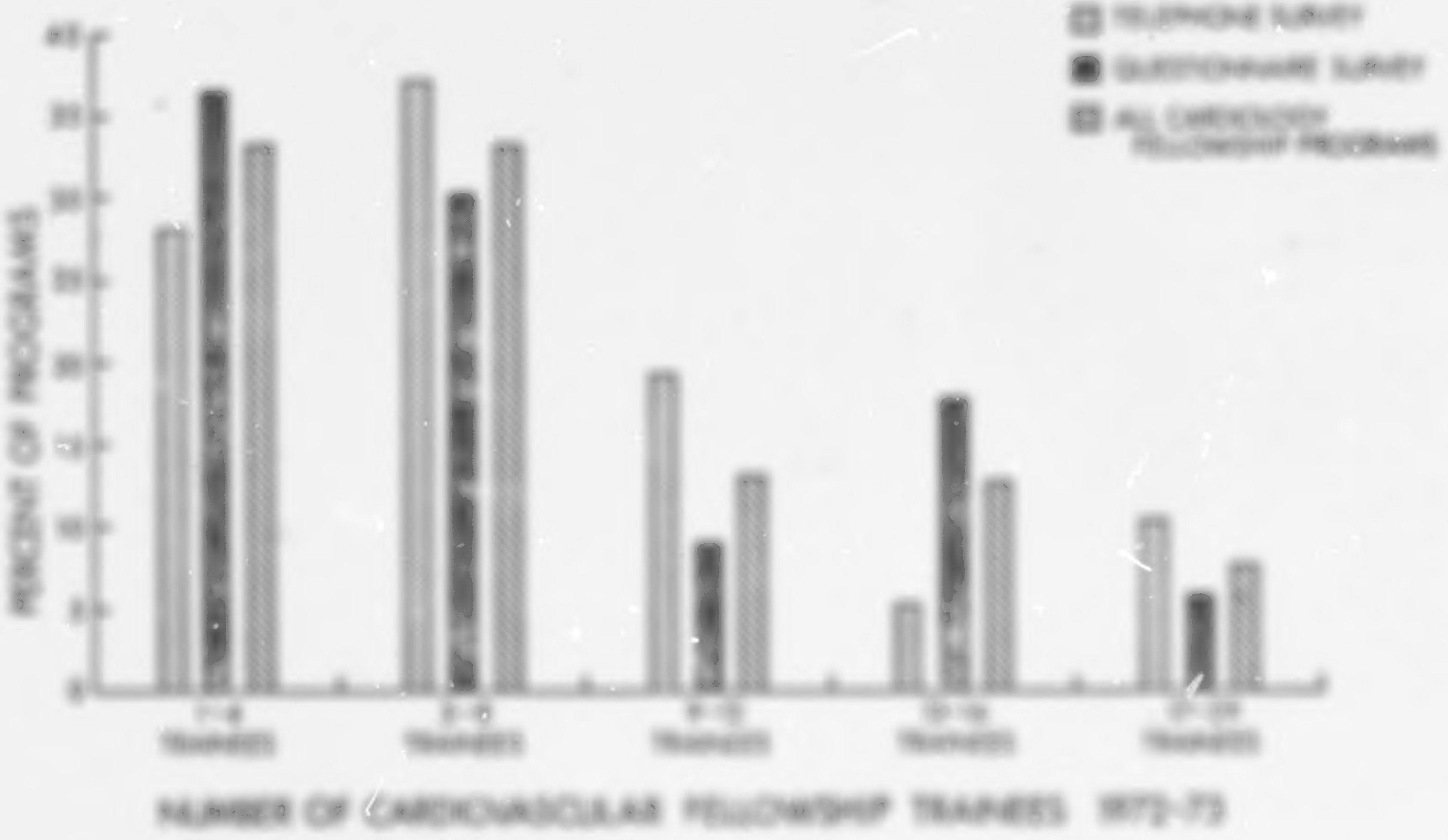
TABLE 11

CARDIOVASCULAR TRAINING PROGRAMS: DISTRIBUTION OF INTERNAL MEDICINE RESIDENCIES BY RESPONDENT CATEGORIES

Cardiovascular Training Programs	Questionnaire Respondents		Telephone Respondents		All	
	N	%	N	%	N	%
Type I: Internal Medicine Residencies = 1 to 15	50	26.3	38	27.3	88	26.8
Type II: Internal Medicine Residencies = 16 to 41	91	47.9	64	46.0	155	47.1
Type III: Internal Medicine Residencies = 42 and over	49	25.8	37	26.7	86	26.1
ALL INSTITUTIONS	190	100.0	139	100.0	329	100.0

FIGURE 13

CARDIOVASCULAR TRAINEES AT PARTICIPATING AND NON-PARTICIPATING TRAINING PROGRAM INSTITUTIONS



3. Secondary Training Program. A cardiovascular training program which provides a portion of the trainee's total training, receives its trainees from a primary program, and provides this training as directed by a primary program.

The distribution of these three primary types of training programs and one secondary type for institutions responding to the survey form and those responding only to telephone queries is given in Table [illegible]. A geographically oriented display of the locations of the [illegible] training institutions is presented in Chapter Five (Figure [illegible]).

Errors Associated with Cardiovascular Training Programs Survey Data

The preceding section presented available information which applies to both the institutions responding to the questionnaire survey and those responding only by telephone. It indicated minor differences in the two groups, none being large enough to indicate that biases would result from working with the respondent data only.

Although there was no sampling for the Cardiovascular Training Programs Survey but [illegible] eligible institutions were contacted and positive responses obtained, the fact that [illegible] percent of the institutions actually responded with survey questionnaire data makes it necessary to attempt to estimate the error associated with these data.

There is insufficient information available on the non-respondents to perform an analysis comparable to that performed for the Force and Training surveys. However, standard errors for percentages derived from the Institutional Survey data can be estimated under the assumption that the respondents represent a random sample drawn from the institution population.

The data from the Institutional Survey were analyzed according to the following groupings:

1. all responding institutions

2. all responding institutions divided into two groups based on length of training program

3. all responding institutions divided into three groups based on size of program

4. all responding institutions divided into three units by program in size, and these divided by the two groupings for length of program

Since the subdivision of responding institutions results in small numbers of responding institutions in the category, errors would be expected to be larger

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]		[illegible]		[illegible]	
	#	%	#	%	#	%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

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CHAPTER 3

CURRENT STATUS OF MANPOWER IN CARDIOLOGY

Walter H. Pritchard and Walter H. Abelmann

INTRODUCTION

As already stated cardiovascular diseases currently represent a major health problem in the United States and account for over 50 percent of the deaths. It is obvious that new methods of diagnosis and treatment will be effective only if skilled physicians and other personnel are available to deliver optimal health care to patients with such illnesses. Thus, there is a need to identify the number of cardiologists, the characteristics of their mode of practice, their qualifications, their regional distribution and other items of importance in understanding the present status of the manpower pool.

It must be realized, however, that the cardiologists surveyed in this study probably only care for a limited segment of the total number of patients seeking care for cardiovascular problems. Primary care physicians composed of general internists and practitioners probably care for at least as large a number of patients with heart disease as does the cardiologist group represented in this study. Cardiologists, however, are more concerned with patients having complex problems requiring more sophisticated diagnostic and therapeutic procedures as well as giving care to the type of patients seen by primary care physicians.

TOTAL PHYSICIAN MANPOWER IN THE UNITED STATES

In order to view in perspective the present studies of the specialty of cardiology, information was collected concerning the total physician manpower pool now available for health care in the United States. This was obtained for certain broad categories, although it is recognized that more detailed studies have been and are being conducted by other specialty groups.

The population of the United States at the time of this study was approximately 206,000,000 people. As shown in Table I the total number of active physicians was estimated to be 311,000 giving a ratio of physicians per 100,000 population of 150.9. If this latter figure is broadly reduced further, we find ratios of physicians per 100,000 population to be as follows: general practice - 28.1, surgical specialties - 41.8, and medical specialties - 81.0.

For our purposes, we have divided the country into nine census divisions excluding Puerto Rico and the Canal Zone. The latter division will be ignored because of likely differences in medical and patient population practices. This Caribbean group represents only 1.3 percent of the total population.

From Table 1 we find that the greatest population densities in order of magnitude are in the following areas: East North Central, Middle Atlantic, South Atlantic, and Pacific. Thereafter, a distinct break in population density occurs and we find fewer people in the West South Central, West North Central, East South Central, New England, and Mountain areas.

Table 2 summarizes some of the important findings relative to physician ratios by broad specialty areas and by census division. The table is of considerable interest and may be interpreted as showing the following:

1. There are differing total physician ratios to population in census tracts of both high population and low population density.

2. There are certain similarities in total physician ratios in some areas of widely differing population densities, i.e., East North Central, West North Central, West South Central, areas in which the ratios fall within a general medium range.

3. High ratios of physician to 100,000 population occur in widely different geographic population density areas, i.e., in densely populated areas of the Middle Atlantic and Pacific zones the physician ratio is similar to that in New England which has next to the smallest number of people in its area.

4. The East South Central area falls much below the national average in total physicians/100,000 but approximates the national average ratio in the number of general practitioners per population being low by virtue primarily of its lack of medical and surgical specialists.

5. With the exception of the Pacific and Mountain areas where the ratios are greatest, there is a fairly uniform ratio of general practitioners in all areas irrespective of size.

6. In general, there are about twice as many medical as surgical specialists per 100,000 population in over half the regions. Exceptions are noted in the West South Central, West North Central, and East South Central areas. The discrepancy here may be assumed to be caused by the lack of medical specialists rather than an excess of surgical specialists since the total number of physicians per 100,000 is also less than the average in these areas.

Many causes may be ascribed to this relative maldistribution, but foremost are those of socio-economic differences and educational, both general and medical, opportunities in the areas of greater physician grouping. More will be stated later about this.

TABLE 1

[illegible] BY POPULATION[1], CENSUS DIVISION BY SELECTED SPECIALTY GROUPINGS

PHYSICIAN DATA SPECIALTY GROUPINGS[1]	National Total Population [illegible] 100%		New England Population [illegible]		Middle Atlantic Population [illegible]		South Atlantic Population [illegible]		East South Central Population [illegible]		West South Central Population [illegible]		East North Central Population [illegible]		West North Central Population [illegible]		Mountain Population [illegible]		Pacific Population [illegible]		Puerto Rico, V.I., Canal Zone Population [illegible]		APO and FPO
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	
ALL PHYSICIANS [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All Active Physicians Federal	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
Non-Federal	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
All Active Surgery		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
All Active General Practice		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
All Active Medical Specialties		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Medical Specialties	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Primary Cardiology[2]	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Internal Medicine		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Other Specialties		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Internal Medicine and Cardiology		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Primary Cardiology[2]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Secondary Cardiology[2]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Other Internal Medicine[3]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	

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[1] Specialty groupings and data pertaining to all except cardiologists obtained from American Medical Association, [illegible]

[2] Data obtained from [illegible] Cardiology Survey.

[3] "Other Internal Medicine" [illegible]

[4] U.S. Bureau of the Census. U.S. Census of Population: 1970, [illegible]

TABLE 2

Distribution Ratios of Physicians to Population: Census Division By Selected Speciality Groupings

Census Division	Population (M)	Ratios Per 100,000 Population			
		Total	General Practice	Medical Specialists	Surgery
Middle Atlantic	37.2	189.4	28.3	110.8	50.3
New England	11.8	184.7	25.7	109.8	49.2
Pacific	26.5	181.3	35.9	97.0	49.0
South Atlantic	30.7	146.2	24.0	80.0	42.1
Mountain	8.3	142.9	30.7	71.5	40.7
East North Central	40.3	125.9	26.6	64.5	34.8
West North Central	16.3	124.5	28.9	61.6	34.0
West South Central	19.3	121.0	27.4	57.6	36.0
East South Central	12.8	104.4	24.7	47.0	32.7

Source: 1, 2

CARDIOLOGY MANPOWER IN THE UNITED STATES

As shown in Table 3 our data indicate there are 10,691 cardiologists in active practice in the United States. This gives a ratio of cardiologists to population of 5.1/100,000. There are an additional 979 cardiologists in training making a total number active or in training of 11,670. Trainees thus constitute 8.4 percent of the total manpower pool of cardiologists.

Cardiologists were classified further into Primary and Secondary types. A Primary Cardiologist gave at least 50 percent of his time to the practice of cardiology. If his estimated percent of effort in cardiology was less than 50 percent, he was classified as a Secondary Cardiologist and his primary classification was in another medical specialty. By this arbitrary classification, there were 5,661 individuals identified as Primary Cardiologists (53 percent of total), and 5,030 or 47 percent fall into the Secondary type. The ratio of 5.1/100,000 changes little if trainees are included because of the small number of trainees involved.

MODE OF PRACTICE OF CARDIOLOGISTS

The great majority (72 percent) of all cardiologists locate their base of practice outside institutions and are classified as Non-Institutional Cardiologists as shown in Table 4. Fifty-four percent of them or 39 percent of all cardiologists are in solo practice and 21 percent of Non-Institutional Cardiologists are over 65 years of age.

Institutional Cardiologists comprise a smaller group (28 percent) of younger men with only 5.4 percent of them over 65 years of age. Approximately 50 percent of them are under the age of 45. This group represents those cardiologists more recently trained and generally responsible for the more sophisticated technical and research aspects of cardiac problems referred to institutions.

BOARD CERTIFICATION OF CARDIOLOGISTS

Certification by specialty boards indicates formal acceptance of practice competence within standards set by the examining bodies. The process of board certification is a strong force in developing clinical expertise in the given specialty. Although 56 percent of all Non-Institutional Cardiologists are certified by the American Board of Internal Medicine, only 9 percent of them are also certified by the Subspecialty Board in Cardiovascular Disease (tables 5 and 6). Proportionally fewer Institutional Cardiologists, 49 percent, are certified by the American Board of Internal Medicine but 18 percent are also certified by the Subspecialty Board in Cardiovascular Disease. These findings on certification were somewhat unexpected but there are no data from which to make a value judgment that board certification indicates better individual clinical performance, the main goal of all boards.

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[illegible]

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[illegible]

TABLE [illegible]

[illegible]

PRACTICE MODE	Under [illegible] Years		[illegible] Years		[illegible] Years and Over		All Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional								
Solo	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Partnership	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Group	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Combination (Other)[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Institutional								
Hospital	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Medical School	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Combination (Other)[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other[illegible]								
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Sub Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]	Specialty Board Certified		Not Certified		Total Respondents	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
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Sub-Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Sub-Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Sub-Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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TABLE 9

CARDIOLOGISTS' RATIOS TO POPULATION: BY RANK-ORDERED METROPOLITAN AREAS OVER 1,000,000 POPULATION

Metropolitan Area[1]	Population[2]	Primary CD Ratio per 100 M	Secondary CD Ratio per 100 M	All CDs Ratio per 100 M
New York	16,062,700	5.6	5.5	11.0
Los Angeles	8,568,000	4.0	3.7	7.7
Chicago	7,797,400	2.8	2.5	5.3
Philadelphia	5,177,000	5.1	3.3	8.4
Baltimore-Washington, D.C.	4,803,900	5.8	3.8	9.5
Detroit	4,693,000	2.4	1.4	3.9
San Francisco	4,529,200	4.3	3.5	7.9
Boston	3,549,000	6.6	3.5	10.1
St. Louis	2,490,300	2.6	2.8	5.5
Cleveland	2,367,500	3.8	3.2	7.0
Dallas-Fort Worth	2,303,000	1.9	2.5	4.5
Pittsburgh	2,242,300	3.3	2.7	6.0
Minneapolis-St. Paul	2,226,300	3.3	2.6	5.9
Houston	2,153,700	3.6	2.1	5.7
Miami	2,128,300	9.0	8.0	17.0
Seattle-Everett-Tacoma	1,998,200	3.6	1.5	5.1
Milwaukee	1,957,000	1.7	1.5	3.3
Atlanta	1,893,600	2.6	3.7	6.3
Cincinnati	1,849,900	2.8	2.5	5.3
Kansas City	1,546,800	2.0	1.9	4.0
Buffalo	1,490,800	3.1	2.4	5.4
Memphis	1,405,600	1.9	1.4	3.2
Providence	1,327,000	3.4	2.9	6.3
San Diego	1,300,000	4.2	2.5	6.7
Indianapolis	1,295,400	3.2	2.2	5.3
Columbus	1,246,000	2.7	2.3	5.1
Portland	1,200,400	2.8	2.3	5.2
Tampa-St. Petersburg	1,171,600	3.7	4.2	7.9
New Orleans	1,117,100	3.5	2.0	5.5
San Antonio	1,116,100	3.3	2.3	5.6
Denver	1,115,100	5.0	2.4	7.4
Louisville	1,085,900	2.0	1.3	3.3
Dayton	1,073,900	2.4	1.5	3.9
New Haven	1,067,200	3.7	3.8	7.4
Greensboro-Winston, Salem	1,066,400	1.5	2.5	4.0
Phoenix	1,058,200	2.6	2.1	4.6
Norfolk-Newport News	1,051,500	1.2	1.4	2.7

[1] Metropolitan area as defined by three digit zip code combinations.

[2] Population estimates related to zip code areas based on 1969 population estimates, "Rand McNally Zip Code Atlas, 1970."

Source: 1, 2

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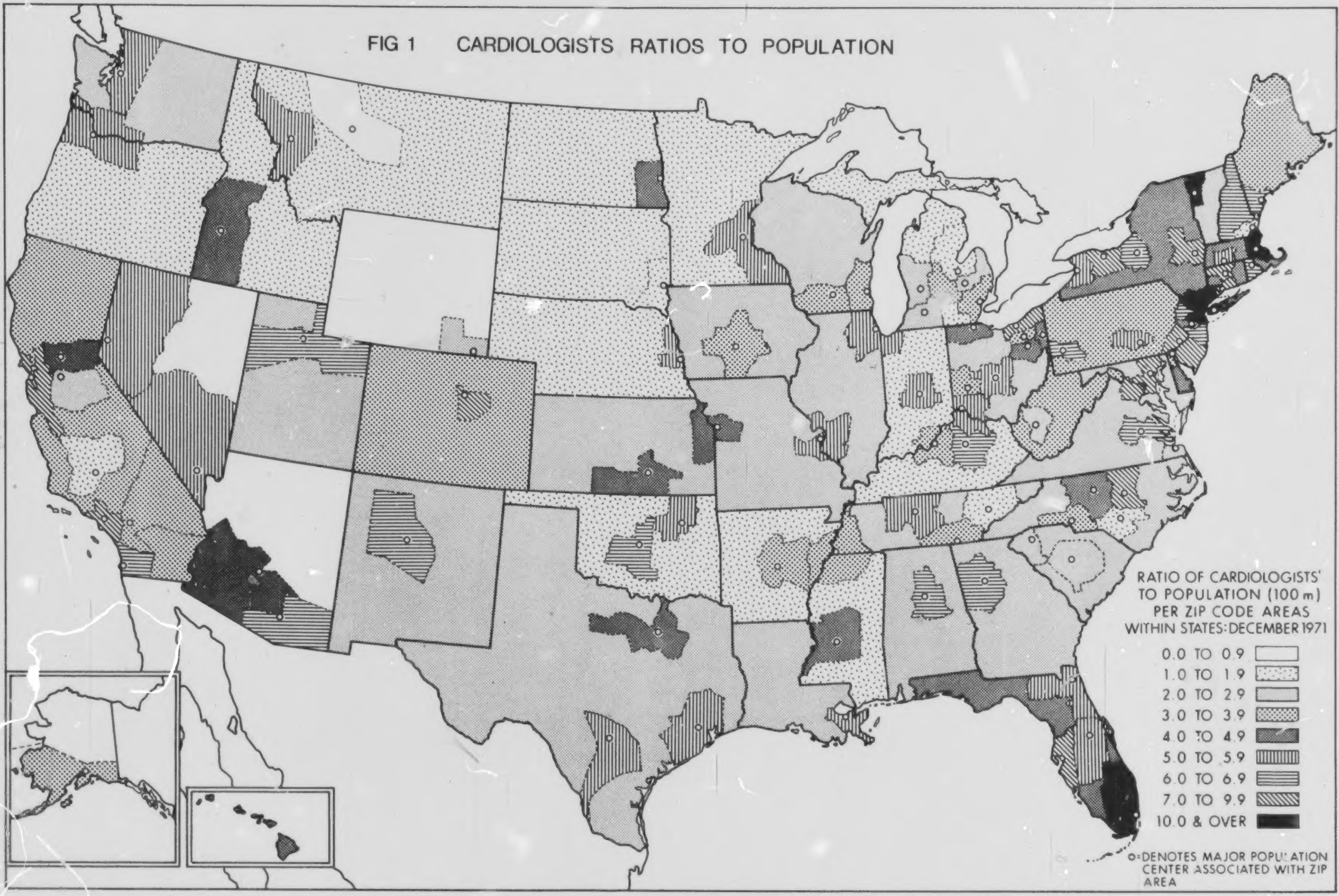
FIG 1 CARDIOLOGISTS RATIOS TO POPULATION


RATIO OF CARDIOLOGISTS' TO POPULATION (100 m) PER ZIP CODE AREAS WITHIN STATES: DECEMBER 1971
0.0 TO 0.9
1.0 TO 1.9
2.0 TO 2.9
3.0 TO 3.9
4.0 TO 4.9
5.0 TO 5.9
6.0 TO 6.9
7.0 TO 9.9
10.0 & OVER
o=DENOTES MAJOR POPULATION CENTER ASSOCIATED WITH ZIP AREA

REFERRAL OF PATIENTS TO CARDIOLOGISTS

Approximately 60 percent of all patients seen by cardiologists come from their own practice with 40 percent referred by other physicians or agencies (Table 10). The referral pattern was essentially the same for both Board Certified and non-certified cardiologists in Internal Medicine.

On the other hand cardiologists with Subspecialty Board Certification in Cardiovascular Disease stated that 53 percent of their patients were referred by other physicians or agencies (Table 11). There seemed to be no marked differences in referral pattern according to census divisions.

DISTANCE TRAVELLED BY PATIENT TO CARDIOLOGISTS

As shown in Table 12, approximately 60 percent of the cardiologists' patients travelled five miles or greater to be seen. For some areas of the country, the percentage of patients who travelled greater than 25 miles varied considerably.

CARDIOLOGISTS' AGE AND YEARS SINCE DEGREE

The average age of all cardiologists is 47.8 years (Table 13). Primary Cardiologists on an average are three years younger than Secondary Cardiologists (46.7 vs. 49.9) and Federal Cardiologists are seven years younger than Non-Federal Cardiologists (41.0 vs. 48.2). As would be expected from the above, Federal Cardiologists have graduated from medical school more recently (by seven years) than Non-Federal, and Primary Cardiologists more recently (by three years) than Secondary as shown in Table 14.

Data on the age distribution of cardiologists show 26 percent are between 25 and 39 years of age; 55 percent are between 40 and 59 years of age; and 21 percent are 60 and over. Some regional differences exist. These are discussed in Chapter 8.

SUMMARY AND RECOMMENDATIONS

There are 10,691 cardiologists in active practice in the United States and approximately 1,000 in training. This gives a ratio of 5.6 cardiologists per 100,000 population. Whether this is an optimal ratio to be maintained in the future cannot be stated. Their numbers seem to be distributed about equally between the Primary Cardiologist and the Secondary Cardiologist. Approximately 70 percent are office based outside institutions and about 50 percent of all cardiologists are certified in Internal Medicine and 10 percent certified in Cardiovascular Disease.

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TABLE 10

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN BY TYPE OF REFERRAL SOURCE: CENSUS DIVISION BY BOARD CERTIFICATION

BOARD CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Board Certified Distribution (N)	1760	315	944	647	122	261	556	230	144	556	23	11
Type of Referral:												
own practice	59.7	61.4	63.3	58.7	54.1	55.7	56.1	57.5	66.5	60.0	59.7	17.7
from other physicians	33.3	32.0	30.4	33.7	36.7	34.8	38.2	37.7	26.8	32.0	29.2	38.6
other (agencies)	7.1	6.6	6.4	7.6	9.1	9.5	5.7	4.8	6.7	8.0	11.1	43.6
Non-Board Certified Distribution (N)	3160	231	899	504	102	218	434	167	97	461	40	7
Type of Referral:												
own practice	61.8	63.6	66.3	60.2	60.0	57.7	62.2	61.9	59.7	56.6	63.8	29.3
from other physicians	29.4	29.9	23.9	30.1	32.0	32.1	30.1	35.5	33.5	34.3	24.2	25.7
other (agencies)	8.7	6.1	9.9	9.7	8.0	10.2	7.6	2.6	6.8	9.1	12.1	45.0

Source: 2

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TABLE 11

PERCENTAGE OF CARDIAC PATIENTS REFERRED TO PHYSICIAN
BY TYPE OF REFERRAL SOURCE:
CENSUS DIVISION BY CARDIOLOGY SUBSPECIALTY BOARD OR CARDIOVASCULAR DISEASE CERTIFICATION

CARDIOLOGY SUBSPECIALTY BOARD OR CARDIOVASCULAR DISEASE CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Cardiology Certified Distribution (N)	670	52	164	118	26	60	94	65	30	72	5	1
Type of Referral:												
own practice	46.3	46.7	46.6	45.5	35.7	44.3	46.3	42.9	48.4	46.3	72.6	5.0
from other physicians	45.6	42.3	45.1	45.8	50.8	45.1	47.7	53.3	45.3	45.1	4.4	95.0
other (specified)	7.7	7.6	8.3	8.5	13.6	6.6	5.8	3.8	6.3	8.6	22.2	0.0
Non-Cardiology Certified Distribution (N)	4250	494	1670	1033	390	380	804	332	311	905	50	16
Type of Referral:												
own practice	61.2	63.6	66.3	60.9	58.4	58.5	60.1	61.7	66.8	58.4	61.3	26.4
from other physicians	30.6	30.8	25.6	30.6	32.6	31.1	33.3	34.6	27.3	32.1	27.9	25.0
other (specified)	7.6	6.2	8.1	8.5	8.8	10.4	6.6	3.8	6.0	8.5	10.8	48.7

Source: 2

TABLE 13

[illegible]

Physician Age Groupings	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		[illegible]	
		New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Less Than 40 Years Distribution (N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mileage												
Less than 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5 to 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
over 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40 Through 54 Years Distribution (N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mileage												
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5 to 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
over 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
55 Years And Over Distribution (N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mileage												
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5 to 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
over 25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: 2

TABLE 13

AVERAGE PHYSICIAN AGE BY PHYSICIAN CLASSIFICATION: BY SPECIALTY

PHYSICIAN CLASSIFICATION	SPECIALTY				ALL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	N	years	N	years	N
Non-Federal	44.7	3428	48.0	3330	46.1	6767
Federal	50.5	390	44.3	335	45.8	674
Average Age	45.2		48.7		47.0	
Total Number (N)		3818		7083		7283

Source: 3

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[illegible]	SPECIALTY				[illegible]	
	[illegible]		[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Non-Federal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Federal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average Score	[illegible]		[illegible]		[illegible]	
Total Number (N)		[illegible]		[illegible]		[illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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TABLE 4

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY		ALL CARDIOLOGISTS (N=7045)
	Primary Cardiologist (N=3876)	Secondary Cardiologist (N=3169)	
Office Consultant for Cardiac Patients	84.1	87.7	85.7
Office ECG Reader	71.5	81.7	76.1
Hospital Consultant for Cardiac Patients	92.9	80.6	87.4
Hospital ECG Reader	77.0	60.9	69.8
Hospital CCU Committee	64.8	53.2	59.6
Cardiac Diagnostic Roentgenography	37.3	14.8	27.2
Cardiac Catheterization	40.9	7.9	26.0

Source: 2

TABLE 5

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY AGE GROUPINGS

PRACTICE MODE	Under 40 Years		40 through 59 Years		60 Years and Over		All Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional								
Solo	349	5.0	1581	22.6	810	11.6	2740	39.2
Partnership	328	4.7	629	9.0	114	1.6	1071	15.3
Group	304	4.4	591	8.5	102	1.5	997	14.3
Combination (Other)*	65	0.9	139	2.0	35	0.5	239	3.4
Sub Total	1046	15.0	2940	42.1	1061	15.2	5047	72.2
Institutional								
Hospital	413	5.9	293	4.2	54	0.8	760	10.9
Medical School	257	3.7	310	4.4	25	0.4	592	8.5
Combination (Other)*	92	1.3	87	1.2	8	0.1	187	2.7
Sub Total	762	10.9	690	9.9	87	1.3	1539	22.1
Other*								
Majority Other	173	2.5	150	2.1	45	0.6	368	5.3
Combined Other	2	0.0	18	0.3	7	0.1	27	0.4
Sub Total	175	2.5	168	2.4	52	0.7	395	5.7
TOTAL	1983	28.4	3798	54.4	1200	17.2	6981	100.0

*In tables, in sections which follow, these "Other" types are combined as "Other" because, for all practical purposes, they include either (1) individuals whose practice involves medical school/hospital plus some non-institutional or (2) are federal cardiologists who simply checked "Other" for their employment. Source: 2

the ages 40 and 59, and in contrast to the younger group, 77 percent of the cardiologists in this age group were Non-Institutional and more than half of these were in solo practice. This trend was even greater in physicians 60 years and older, representing 17 percent of the entire group. Nearly 90 percent of the older cardiologists were in the Non-Institutional mode and 76 percent of these were in solo practice. Thirty-eight percent of those physicians below the age of 40 were Institutionally employed with a dominance in hospital as opposed to medical school positions. Eighteen percent of physicians 40 through 59 years were Institutionally employed equally divided between hospital and medical school distribution, while only 7 percent of those 60 years or over were Institutionally employed.

The distribution of cardiologists by practice mode and specialty board (internal medicine) certification is demonstrated in Table 6. While a majority (55 percent) of Non-Institutional Cardiologists were certified, certified or non-certified physicians were equally represented in Institutions.

Table 7 demonstrates the distribution of cardiologists by subspecialty board certification in cardiovascular disease. Less than 9 percent of Non-Institutional Cardiologists and 13 percent of Institutional Cardiologists were subspecialty certified. The latter category included 19 percent of medical cardiologists, and 9 percent of hospital cardiologists.

When we examine the functional activities of all cardiologist by age groupings (Table 8), virtually all undertook similar duties as regards office consultation for cardiac patients, reading of office electrocardiograms and providing hospital consultation for cardiac patients. Cardiologists less than 40 years spent less time reading office electrocardiograms. Physicians under the age of 60 years participated more frequently as electrocardiographic readers in the hospital and on the coronary care unit committees than did older physicians. In the application of new and special skills, including cardiac diagnostic roentgenography and cardiac catheterization there was significantly greater listing of activity in these categories in physicians under the age of 40. In contrast, cardiologists 60 years and over participated to minimal degree in these activities. Whereas 50 percent of physicians of less than 40 conducted cardiac catheteriations, only 2.6 percent of physicians over the age of 60 provide these services. When these activities were examined within the categories of Primary or Secondary Cardiologist (Table 4) there was a reduction in the participation of the Secondary Cardiologists in the more highly skilled activities: hospital ECG readers; CCU Committee; diagnostic roentgenography; and cardiac catheterization. The distribution of activities by age of cardiologist is open to amny interpretations and may change in the future as an adequate number of physicians are trained in a required skill, or new skills are developed.

Table 9 demonstrates in detail the distribution of professional activity time and the proportion of time concerned with cardiology. Among Non-Institu-

TABLE 6

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY SPECIALTY BOARD CERTIFICATION IN INTERNAL MEDICINE

PRACTICE MODE	Specialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	1341	19.0	1426	20.1	2767	39.1
Partnership	701	9.9	385	5.4	1086	15.3
Group	675	9.5	333	4.7	1008	14.2
Combination (Other)*	136	1.9	106	1.5	242	3.4
Sub Total	2853	40.3	2250	31.7	5103	72.0
Institutional						
Hospital	343	4.9	435	6.1	778	11.0
Medical School	329	4.7	273	3.9	602	8.5
Combination (Other)*	102	1.4	87	1.2	189	2.7
Sub Total	774	11.0	795	11.2	1569	22.2
Other*						
Majority Other	186	2.6	193	2.8	379	5.4
Combination Other	13	0.2	14	0.2	27	0.4
Sub Total	199	2.8	207	3.0	406	5.8
TOTAL	3826	54.1	3252	45.9	7078	100.0

*See Footnote, Table 5

TABLE 7

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY SUBSPECIALTY BOARD CERTIFICATION IN CARDIOVASCULAR DISEASE

PRACTICE MODE	Subspecialty Board Certified		Non-Certified		Total Cardiologists	
	Number (N)	Percent (%)	Number (N)	Percent (%)	Number (N)	Percent (%)
Non-Institutional						
Solo	187	2.6	2580	36.5	2767	39.1
Partnership	105	1.5	981	13.8	1086	15.3
Group	114	1.6	894	12.6	1008	14.2
Combination (Other)*	31	0.4	211	3.0	242	3.4
Sub Total	437	6.1	4666	65.9	5103	72.0
Institutional						
Hospital	67	1.0	711	10.0	778	11.0
Medical School	115	1.6	487	6.9	602	8.5
Combination (Other)*	29	0.4	160	2.3	189	2.7
Sub Total	211	3.0	1358	19.2	1569	22.2
Other*						
Majority Other	36	0.5	343	4.9	379	5.4
Combination Other	1	0.0	26	0.4	27	0.4
Sub Total	37	0.5	369	5.3	406	5.8
TOTAL	685	9.6	6393	90.4	7078	100.0

TABLE 8

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED
TYPES OF CARDIOLOGY ACTIVITIES:
BY PHYSICIAN AGE GROUPINGS

TYPE OF ACTIVITY	PHYSICIAN AGE GROUPINGS			ALL CARDIOLOGISTS (N=6954)
	Less than 40 Years (N=1964)	40 to 59 Years (N=3782)	60 Years or Over (N=1208)	
Office Consultant for Cardiac Patients	76.0	90.1	88.1	85.7
Office ECG Reader	66.1	80.3	79.3	76.1
Hospital Consultant for Cardiac Patients	91.0	89.9	74.3	87.5
Hospital ECG Reader	76.5	71.1	55.5	69.9
Hospital CCU Committee	61.4	64.2	42.6	59.6
Cardiac Diagnostic Roentgenography	42.1	23.7	13.8	27.2
Cardiac Catheterization	51.4	21.5	2.6	26.1

Source: 2

TABLE 9

[illegible]
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PRACTICE MODE	[illegible]	Time Allocation	TYPE OF ACTIVITY Direct Patient Care	Research with Patient Care	Teaching with Patient Care	Sub Total Clinical	Research without Patient Care	Teaching without Patient Care	Sub Total Non-Clinical Res. & Teach.	Administration	[illegible]
			%	%	%	%	%	%	%	%	%
NON-INSTITUTIONAL											
Solo	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Partnership	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Group	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Sub Total	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
INSTITUTIONAL											
Hospital	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Medical School	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Sub Total	[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
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TABLE 14

CARDIOLOGIST'S CONTACTS WITH PATIENTS:
WEIGHTED AND UNWEIGHTED PATIENT ENCOUNTERS
BY TYPE OF SETTING
BY SPECIALTY AND PRACTICE

Type of Setting	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	N	%	N	%	N	%	N	%	N	%
Office										
Unweighted	3748	36.3	5334	51.7	655	6.3	590	5.7	10327	100.0
Weighted	4610	34.5	8155	61.1	380	2.8	218	1.6	13363	100.0
Hospital										
Unweighted	3370	38.0	2674	30.1	1743	19.6	1092	12.3	8879	100.0
Weighted	4145	42.9	4091	42.4	1011	10.5	404	4.2	9651	100.0
Combined										
Unweighted	7118	37.0	8008	41.7	2398	12.5	1682	8.8	19206	100.0
Weighted	8755	38.1	12251	53.2	1391	6.0	622	2.7	23014	100.0

Source: 3

Table 15 indicates by category the site and referral pattern and cardiac and non-cardiac encounters. In the relative percentage of referrals and Primary Cardiac encounters, the Primary Institutional Cardiologist differed from his Non-Institutional colleagues, in that he accounted for 12.9 percent of referrals and only 3 percent of patients originated from his own practice. Non-Institutional Primary Cardiologists representing, 37.5 percent of all cardiologists, reported 34.3 percent of patients from his own practice and 45.4 percent of the referral patients. Corresponding values for the Secondary Non-Institutional Cardiologist (40.6 percent of all cardiologists) were 60.6 and 37.3 percent.

Table 16 examines the age categories of patients seen by practicing cardiologists. The number and percentage of encounters are related to the national population distribution as of 1970, in the right column. In this survey, a disproportionately small number of patients between the ages of 0 and 35 are seen by cardiologists. Between the ages of 35 and 44, patients were seen by these physicians in proportion to their prevalence in the 1970 population. Above 45 years there is a rapid increase in the numbers of patients seen by cardiologists. Thus, patient encounters above the age of 65 amounted to 33 percent of all office encounters in an office setting, and 42 percent of those in a hospital setting as compared to the prevalence in the population of this age category of approximately 10 percent.

Table 17 from the diary report confirms certain substantive differences between practice activities. Of considerable significance is the overall allocation of time of the Non-Institutional practitioner (74 percent) devoted to patient care, while approximately 39 percent of the activity of Institutional practitioners was so allocated. Only in the category of laboratory and diagnostic testing - reflecting cardiac catheterization and coronary arteriography - do Primary Institutional practitioners provide a greater level of participation in patient care than Non-Institutional practitioners. Little or no research was conducted by the Non-Institutional practitioner, but a substantive amount of teaching with patients which amounted to about 50 percent of the time devoted to this activity by the Institutional practitioner was so reported. With the exception of the Secondary Institutional practioner (presumably department heads, deans etc.) who devoted 22 percent of his time to administration, all categories had a similar distribution of administrative time (about 10 percent).

The distribution of cardiac problems in office and hospital settings is shown in Table 18. The category "none" includes patients with another primary medical diagnosis or in some cases those patients referred for anethesia check, evaluation of innocent murmurs and for cardiac catheterization and found to be normal (some of these will be listed under "none"). The cardiac problems most frequently encountered in the office were coronary atherosclerosis without acute myocardial infarction, hypertension with chronic heart failure, acute myocardial infarction, arrhythmias and a wide variety of other cardiac and vascular abnormalities. Except for the anticipated higher prevalence of acute myocardial infarction and severe heart failure, a similar pattern was seen in

TABLE 15

CARDIOLOGISTS' PATIENT DISTRIBUTION: PRACTICE CHARACTERISTICS PERCENT DISTRIBUTION BY SPECIALTY AND PRACTICE

Practice and Patient Characteristics	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Percent of Cardiologists	37.6	40.7	16.2	5.5	100.0
Percent of Patient Encounters					
Office	34.5	61.1	2.8	1.6	100.0
Hospital	42.9	42.4	10.5	4.2	100.0
Combined	38.1	53.2	6.0	2.7	100.0
Percent of Patients					
Office	35.5	60.1	2.7	1.7	100.0
Hospital	41.7	39.9	13.2	5.2	100.0
Combined	37.3	54.1	5.8	2.7	100.0
Percent of Patients within Own Practice					
Office	32.1	64.5	1.9	1.6	100.0
Hospital	38.9	52.4	5.5	3.2	100.0
Combined	34.3	60.6	3.0	2.1	100.0
Percent of Patients-Referral					
Office	42.2	48.6	7.2	2.0	100.0
Hospital	47.1	31.2	16.1	5.6	100.0
Combined	45.4	37.3	12.9	4.3	100.0
Percent of Primary Cardiac Encounters					
Office	44.5	49.4	4.7	1.4	100.0
Hospital	49.8	32.5	13.8	3.9	100.0
Combined	47.0	41.5	9.0	2.6	100.0
Percent of Primary Non-Cardiac Encounters					
Office	26.2	70.6	1.3	1.9	100.0
Hospital	36.6	52.2	6.4	4.7	100.0
Combined	30.1	63.8	3.2	2.9	100.0

Source: 3

TABLE 16

CARDIOLOGISTS' PATIENTS: AGE GROUPS BY TYPE OF SETTING COMPARED TO NATIONAL AGE GROUPED NORMS

AGE GROUPS (in years)	OFFICE	HOSPITAL	COMBINED	NATIONAL NORMS[1] (1970)	
	%	%	%	%	N
4 and Under	0.6	0.6	0.6	8.4	17,119,245
5 through 14	1.8	1.3	1.6	20.1	40,892,234
15 through 24	8.2	4.8	7.2	17.4	35,302,039
25 through 34	7.7	4.9	6.9	12.2	24,845,947
35 through 44	10.8	9.9	10.5	11.4	23,132,821
45 through 54	17.8	15.6	17.2	11.4	23,158,493
55 through 64	20.0	20.7	20.2	9.2	18,660,224
65 through 74	20.8	24.1	21.8	6.1	12,439,678
75 through 84	10.4	14.5	11.6	3.8	7,662,196
85 and Over	1.9	3.6	2.4	*	
TOTAL	100.0	100.0	100.0	100.0	203,212,877

[1] National Norms: U.S. Bureau of the Census
Census of Population 1970
General Social and Economic Characteristics
Final Report PC(1)-C1 United States Summary

*Census categories group all who are 75 and over.

Source: 3

TABLE 17

CATEGORIES OF CARDIOLOGISTS' AVERAGE DAILY ACTIVITY TIME: TYPE OF ACTIVITY BY SPECIALTY AND PRACTICE

Type of Activity	Non-Institutional				Institutional				All Cardiologists*	
	Primary		Secondary		Primary		Secondary			
	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours	% of Time	Hours
DIRECT PATIENT CARE										
Unspecified	1.8		5.0		1.6		4.2		3.1	
Hospital	23.7		21.0		15.3		15.0		20.9	
Office	30.3		36.7		3.2		6.7		27.2	
Non-scheduled, Emergency	1.8		2.1		0.8		1.6		1.8	
Lab and Diagnostic Tests	5.4		3.8		9.0		4.7		5.3	
Extended Care Facilities	0.4		1.0		0.0		1.8		0.6	
Patient Records, Charts	7.5		6.1		7.0		6.3		6.7	
Subtotal	70.9	5.9	75.7	6.6	36.9	3.1	40.3	3.4	65.6	5.6
TEACHING										
With Patients	6.6		4.0		13.2		8.5		6.7	
Without Patients	2.4		1.2		6.8		9.5		3.0	
Subtotal	9.0	0.8	5.2	0.5	20.0	1.7	18.0	1.5	9.7	0.8
RESEARCH										
With Patients	0.2		0.2		2.0		1.8		0.6	
Without Patients	1.4		0.8		16.0		5.5		3.9	
Subtotal	1.6	0.1	1.0	0.1	18.0	1.5	7.3	0.6	4.5	0.4
PROFESSIONAL	10.1	0.8	9.3	0.8	13.7	1.2	12.5	1.1	10.4	0.9
GENERAL ADMINISTRATION	8.4	0.7	8.8	0.8	11.4	1.0	21.9	1.9	9.8	0.8
TOTAL	100.0	8.3	100.0	8.8	100.0	8.5	100.0	8.5	100.0	8.5

*Percentages based on weighted frequencies, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 18

CARDIOLOGISTS' PATIENTS WITH PRIMARY CARDIAC DIAGNOSES: RANK ORDERED PERCENTAGE OF OCCURRENCE BY TYPE OF SETTING

Primary Cardiac Diagnosis	Type of Setting		
	Office %	Hospital %	Combined %
Percent of Total	70.2	29.8	100.0
Coronary Atherosclerosis without Infarction	29.3	19.9	26.1
Hypertension	26.5	9.1	20.7
Acute Myocardial Infarction	4.9	18.1	9.4
Heart Failure: Chronic, Severe	7.0	10.2	8.1
None	7.1	3.0	5.8
Rheumatic	5.0	5.2	5.1
Arrhythmia	3.9	4.5	4.1
Cerebral Vascular Disease	3.0	4.1	3.4
Peripheral Vascular Disease	3.0	3.3	3.1
Heart Failure: Acute, Severe	1.3	6.2	2.9
Other	1.9	2.2	2.0
Pulmonary Embolism	0.8	3.1	1.6
Psychosomatic (Cardiac)	1.7	1.3	1.6
Post Cardiac Surgery	1.2	2.5	1.6
Congenital	1.3	1.8	1.5
Cardiomyopathy	1.2	1.9	1.4
Pacemaker Evaluation	0.6	1.3	0.9
Pericardial Disease	0.5	1.2	0.6
Infectious	0.0	0.3	0.1
Total	100.0	100.0	100.0

Source: 3

the hospital. Extremely few encounters were reported relative to activities such as pacemaker evaluation (0.4 - 1.3 percent). A small but significant prevalence (1.1 percent) of congenital heart disease was reported by these physicians. This is summarized in Figure 1. It was to be expected that the proportion of acute myocardial infarction and acute severe cardiac failure seen in the hospital exceeded that seen in the office by a factor of four. On the contrary, the prevalence of hypertension identified as a problem in office setting was twice that of its prevalence in the hospital. Figure 2 presents the percent of non-cardiac diagnoses for all cardiologists. The distribution is as might be anticipated.

The choice of cardiac diagnostic and therapeutic modalities according to patient diagnosis is indicated in Table 19. There was a significantly greater use of non-invasive procedures, cardiac catheterization and evaluation for cardiac surgery in the hospital than in the office. A high percentage of patients with congenital heart disease, rheumatic heart disease, cardiomyopathy and infection (presumably bacterial-endocarditis) were considered for cardiac catheterization. A relatively small percentage of patients with coronary atherosclerosis were so referred. Evaluation for cardiac surgery was recommended in patients with congenital heart disease, "infections" and rheumatic disease in a high proportion of instances. Evaluation of cardiovascular surgery in an office or hospital setting was undertaken for a very small proportion of patients with coronary atherosclerosis.

Table 20 shows those diagnostic tests and procedures recommended by different categories of physicians. Vectorcardiography, phonocardiography, and non-invasive techniques as well as right or left heart catheterization with or without angiography were utilized dominantly by Institutional Primary Cardiologists.

Figure 3 indicates the allocation of time by the cardiologist to the patient in the office and hospital. The physician averaged between 6 and 15 minutes to visit both the office and hospitalized patient. A second peak of time distribution between 26 and 30 minutes for both the office and hospital patient may so indicate the average duration of first visits. Only in a very small proportion of instances did the duration of physician-patient contact exceed 60 minutes, in either the hospital or office setting.

SUMMARY AND RECOMMENDATIONS

As expected, this study has shown that many older cardiologists who obtained training prior to the extensive use of cardiac catheterization and cardiovascular surgery are using their valuable professional skills in clinical diagnosis, electrocardiography, the management of arrhythmias and the drug therapy of heart disease. On the other hand, younger physicians who are recent graduates of contemporary training programs, are utilizing strikingly different techniques and hence contribute through a different form of practice.

FIGURE [illegible]

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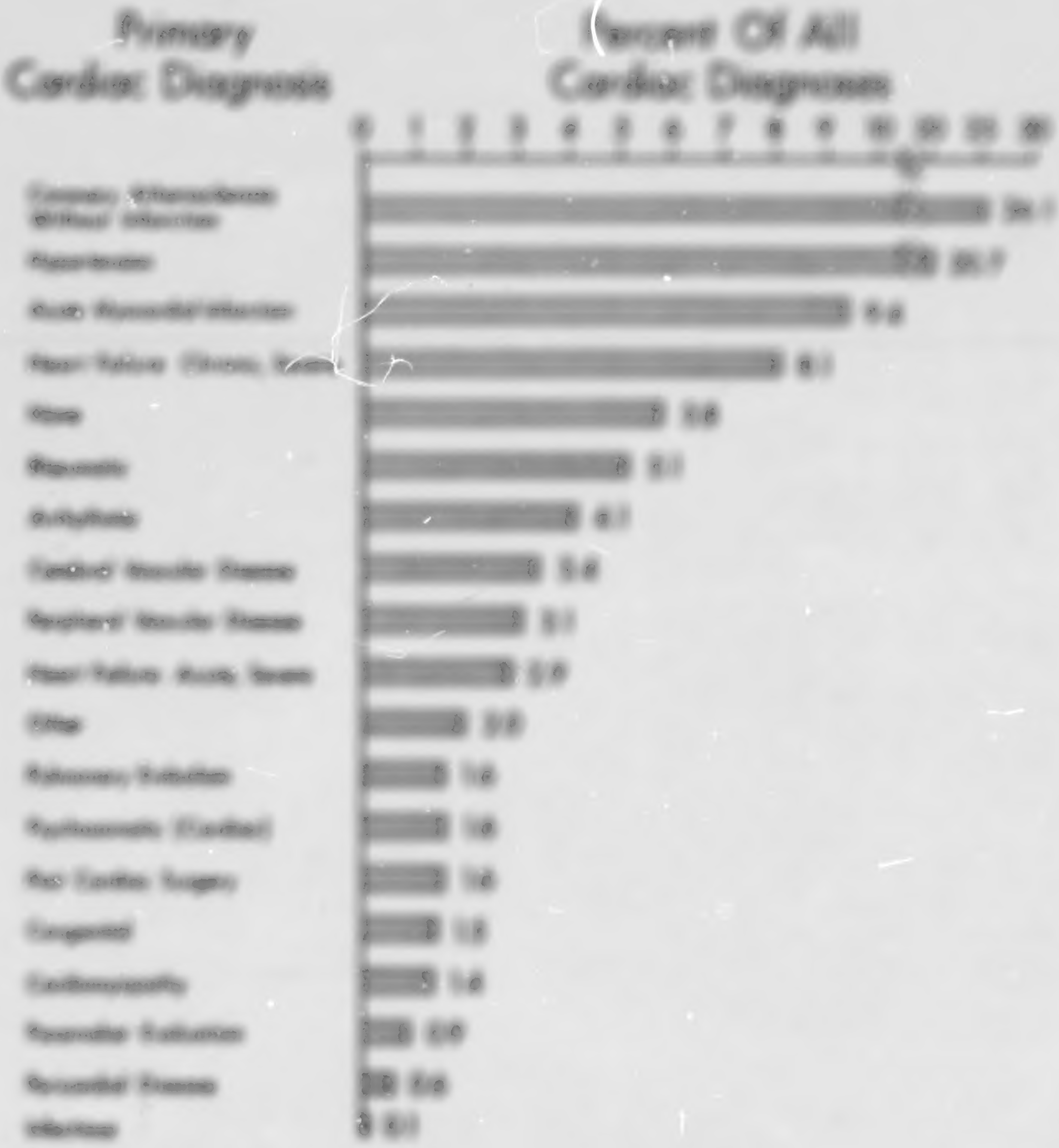

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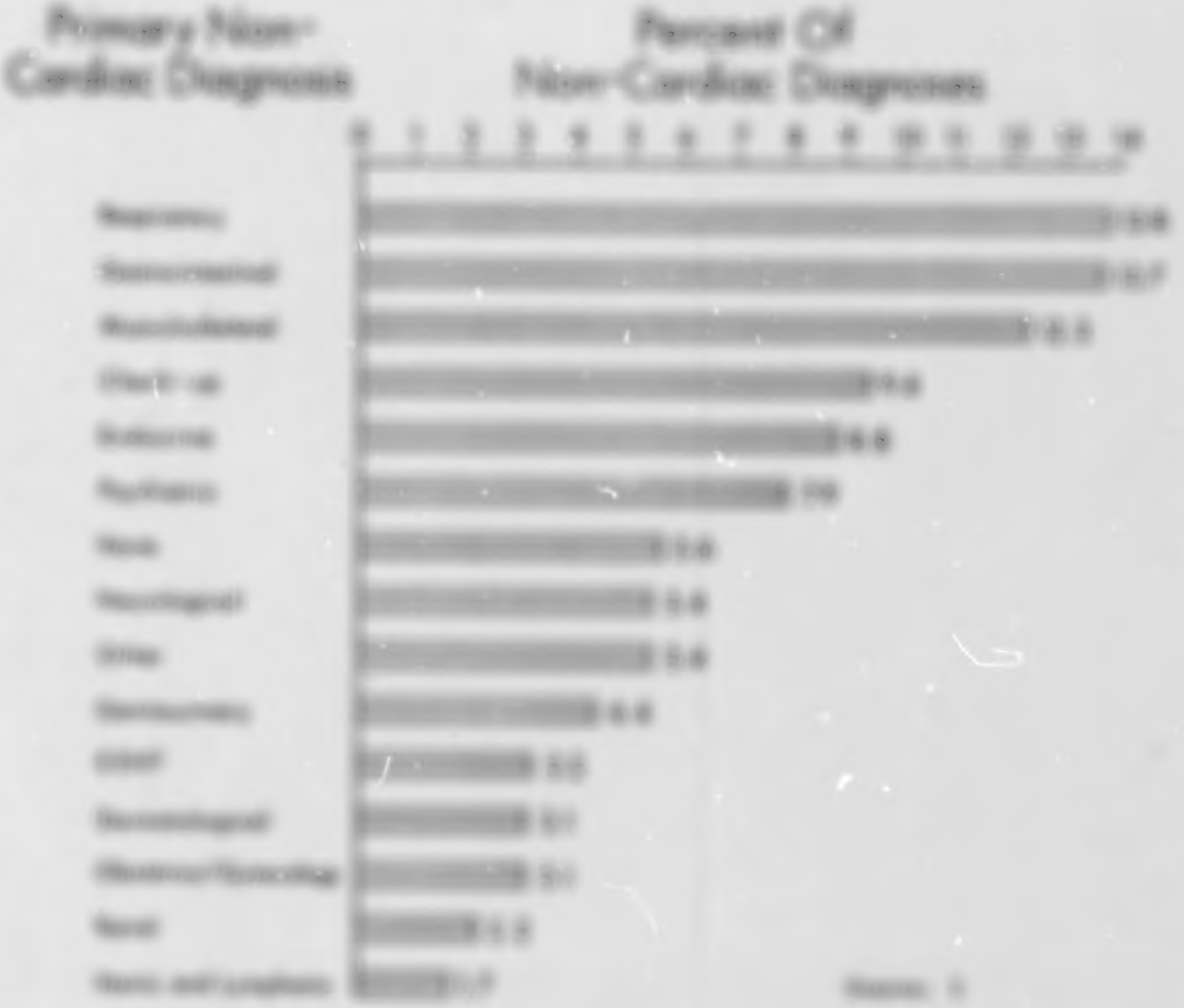
Primary Non-Cardiac Diagnosis
Percent Of Non-Cardiac Diagnoses
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Respiratory
13.9
Gastrointestinal
13.7
Musculoskeletal
12.3
Check-up
9.4
Endocrine
8.8
Psychiatric
7.9
Nose
5.6
Neurological
5.4
Other
5.4
Genitourinary
4.4
Cancer
3.2
Dermatological
3.1
Obstetrics/Gynecology
3.1
Renal
2.2
Blood and Lymphatic
1.7

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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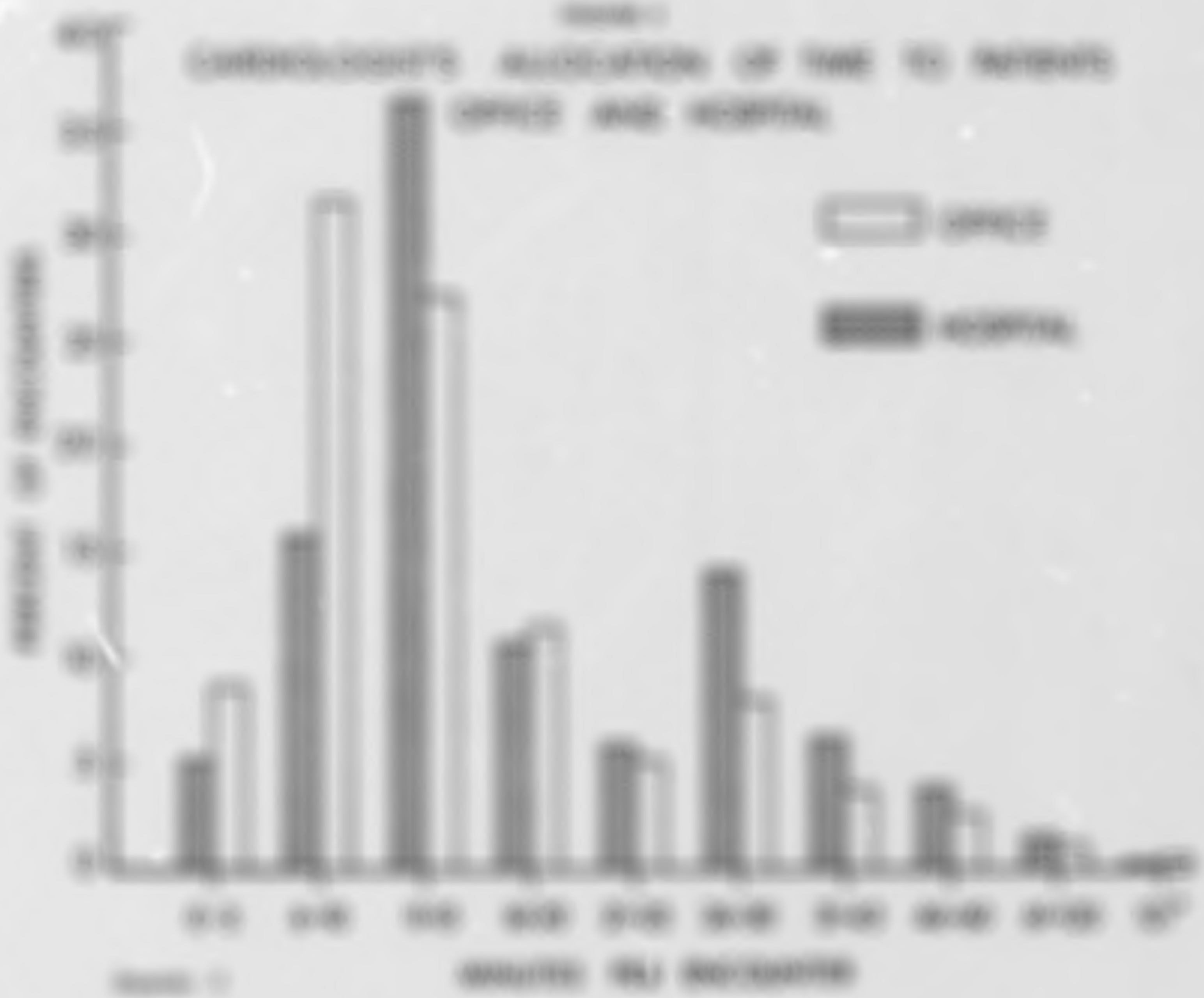
FIGURE 1

COMPARATIVE ALLOCATION OF TIME TO PATIENTS
OFFICE AND HOSPITAL



practice is based upon the special skills with which training in the more recent past has provided him. The Cardiac Specialist will be competent in the conduct of clinical investigation although it is unusual for him to have highly developed skills or motivation. He will be engaged in investigation related directly to the disease state of patients who come under his care. He will contribute to the medical literature in this respect with clinical descriptions of unusual cardiovascular disease. He will report the results of special procedures and tests in interesting or unusual clinical circumstances. It is only rarely that he will conduct basic laboratory investigations. He will be actively involved in the teaching of medical students, house officers, and nurses. He will be capable of writing modern guidelines for optimal care of cardiac patients in his community hospital and in the promulgation of such information to the community at large. He will usually be Institutionally based but may combine this with an office practice within or outside of the institution. He will usually be salaried by the institution but a wide variety of financial arrangements for compensation will exist. His patients are usually physician-referred, often from internists, Internist-Cardiologists or Clinical Cardiologists. This physician is younger than those in Non-Institutional practice by virtue of the recent expansion of technology in the field of cardiology.

Academic Cardiologist. The Academic Cardiologist is not definable within a single profile but is an individual who may devote his time to several important categories of activity. He will not spend the majority of his time in direct patient care. It is usual, however, for his responsibilities to be divided between teaching in a clinical setting, research in a clinical or basic setting, administration and clinical care in that order of relative effort. The background of the Academic Cardiologist usually involves certification in internal medicine and frequently in cardiovascular diseases. His training has involved cardiac catheterization as well as electrocardiography and clinical cardiology. He has usually devoted 1-2 years to cardiovascular research, frequently in the basic science areas. The age of such individuals is similar to the Clinical Cardiologist - older than the cardiac specialist and younger than the Internist-Cardiologist. He is institutionally based and usually institutionally compensated. He will frequently be director of professional programs and perhaps of a patient service area such as a heart station.

The above four categories describe in a general way the present activities of adult cardiologists and hence serve to define a distribution of physician skills. Clearly they do not represent a rigid categorization either of specific professional skills or personal professional arrangements. Consideration of the data may allow prediction of training needs and geographic distribution.

Recommendations regarding the content and type of training for the various categories of cardiologists are found in Chapters Five and Six. Those pertaining to the numbers required in each category are found in Chapter Seven.

CHAPTER 5

TRAINING PROGRAMS IN CARDIOLOGY

Noble O. Fowler, Herbert N. Hultgren, and Henry D. McIntosh

INTRODUCTION

A major objective of this study was to identify and describe in some detail the number, distribution, content, quality, duration, faculty, facilities and certain other aspects of training programs in cardiology in the United States today. Such information, as well as number of trainees positions available, filled and potential for expansion was unknown prior to the study, but it seemed essential in considering the manpower needs in cardiology.

Training Programs were defined as full-time cardiovascular training programs of at least one year's duration. This definition was developed during the study when it became apparent that there were no listings of cardiovascular disease training programs. The source listing for training programs was provided by the American Medical Association and consisted of approximately 500 institutions in the United States with approved residencies in Internal Medicine. This study included 329 institutions involved in cardiovascular disease training.

NUMBER AND DISTRIBUTION OF TRAINING PROGRAMS

There were 534 institutions and organizations either responsible for or conducting internal medicine training programs at the beginning of 1973. Of these, 329 offered at least one year of training in cardiology, with the majority (73 percent) providing training of two years duration.

The data in this report are based on the returns of a questionnaire from directors of 190 of the 329 programs who responded to the questionnaire. All estimations have been projected for the 329 programs with the assumption that the non-responding programs were similar to the programs responding to the questionnaire. The validity of this assumption is discussed in the section on methods (Chapter 2). The number of training programs in non-approved hospitals is probably small and was excluded from this report.

Figure 1 shows the geographical distribution of the 329 training programs in cardiology by state, census division and region. As might be expected, the training programs were most numerous in the areas of high population density.

Table 1 shows the total number of trainees in the 329 programs for the years 1970-1973. In addition, Table 1 shows the average number of trainees per program by year with an estimate of the number of trainees completing the training each year. It is obvious that the number for each variable has increased

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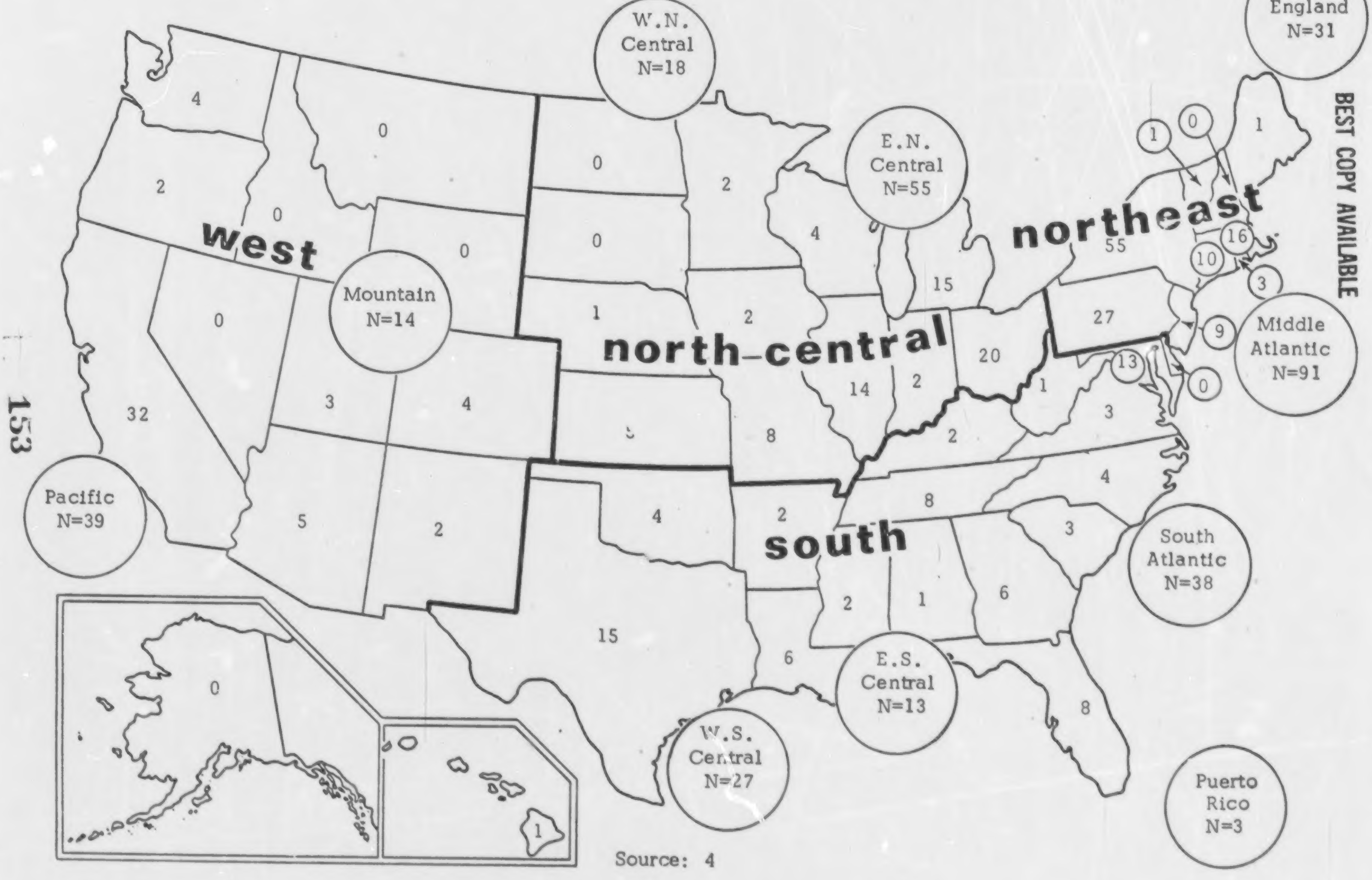
FIGURE 1
DISTRIBUTION OF CARDIOVASCULAR TRAINING PROGRAMS



W.N. Central N=18
New England N=31
E.N. Central N=55
Mountain N=14
Middle Atlantic N=91
Pacific N=39
South Atlantic N=38
E.S. Central N=13
W.S. Central N=27
Puerto Rico N=3
west
north-central
northeast
south
4
0
2
0
0
0
0
2
1
2
4
15
55
1
0
1
16
10
3
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9
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0
3
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14
2
1
32
3
4
8
2
3
8
4
2
5
2
4
2
1
6
3
15
6
8
0
1

Source: 4

TABLE 1

Numbers of Trainees Enrolled and Completing Training 1970-1973

Year	Number of Trainees Enrolled	Average Number of Trainees/Program	Number of Trainees Completing Training
1970-71	970	3.09	617
1971-72	1188	3.79	711
1972-73	1278	4.09	791

Source: 4

over the past three years and that we can anticipate having about 800 individuals complete their training each year. The actual number may be somewhat larger due to trainees completing programs in non-approved hospitals and trainees who take their final year of training in positions outside of a cardiology program such as a final year of medical residency or an instructorship.

It is of interest to note that cardiologists tend to practice in areas close to where they were trained. This is shown in Figures 2 and 3. They may have selected their training program based on an area where they plan to practice. Either selection before initiating training or during training seems to have the effect of locating the majority of cardiologists.

Candidates who are seeking certification in the subspecialty of cardiovascular disease have increased over the past four years as evidenced by the numbers taking the oral and written examination. Data obtained from the Subspecialty Board on Cardiovascular Disease indicate consistent increases from 1969 through 1972 as follows:

Oral Examinations in 1969 for 84 candidates with 64 certified
Oral Examinations in 1970 for 126 candidates with 92 certified
Oral Examinations in 1971 for 135 candidates with 119 certified

Written Examinations in 1972 for 543 candidates with 431 passing the examination.

CONTENT AND DURATION OF TRAINING

Considerable variability was found in the content of the various cardiology training programs surveyed. Some of the variability was due to whether the program offered was of one or two years duration. At the present time, it is not known to what extent the different programs can and are able to meet the high standards of training experience recommended by the Subspecialty Board in Cardiovascular Disease. The detailed recommendations of this Board appear in Chapter 8, page 293. Major elements of their recommendation include: acquisition of clinical skills used in diagnosis, mastery of laboratory techniques, instruction and experience in management of various types of heart disease, and opportunity for research. They stress the importance of a certain core experience provided in sufficient depth and with sufficient emphasis on scholarship, self-instruction and development of critical judgement, so that the trainee-product of the program will not become dated after he has entered his chosen profession.

As shown in Table 2, most of the trainees entering cardiology training programs have had two years of post-M.D. training prior to entering the program. Forty-nine percent of the programs required two years, and 46 percent required three years. Thus, less than half of the entering trainees (46 percent) have fulfilled

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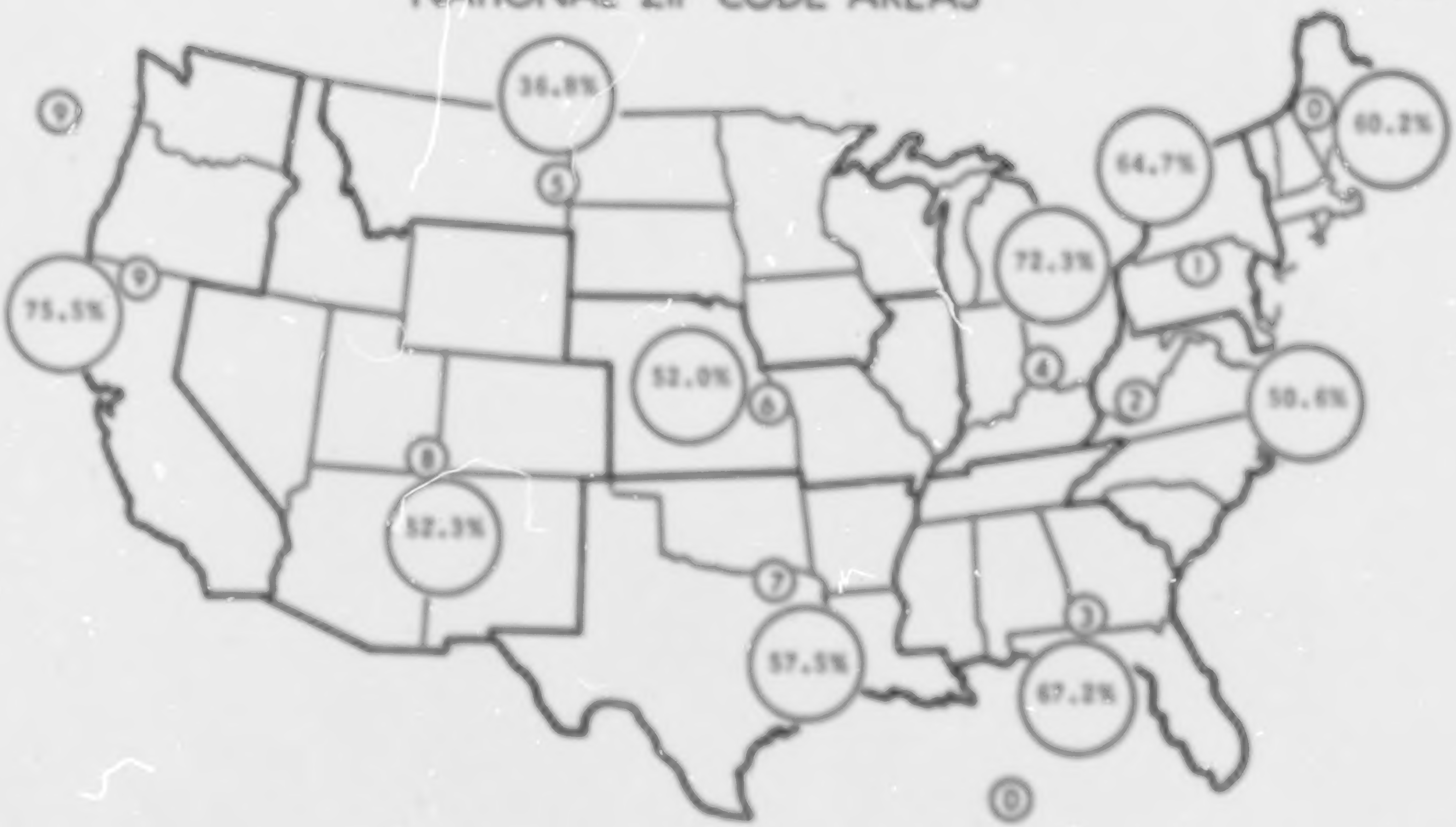
FIGURE 2

NATIONAL ZIP CODE AREAS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75.5%
9

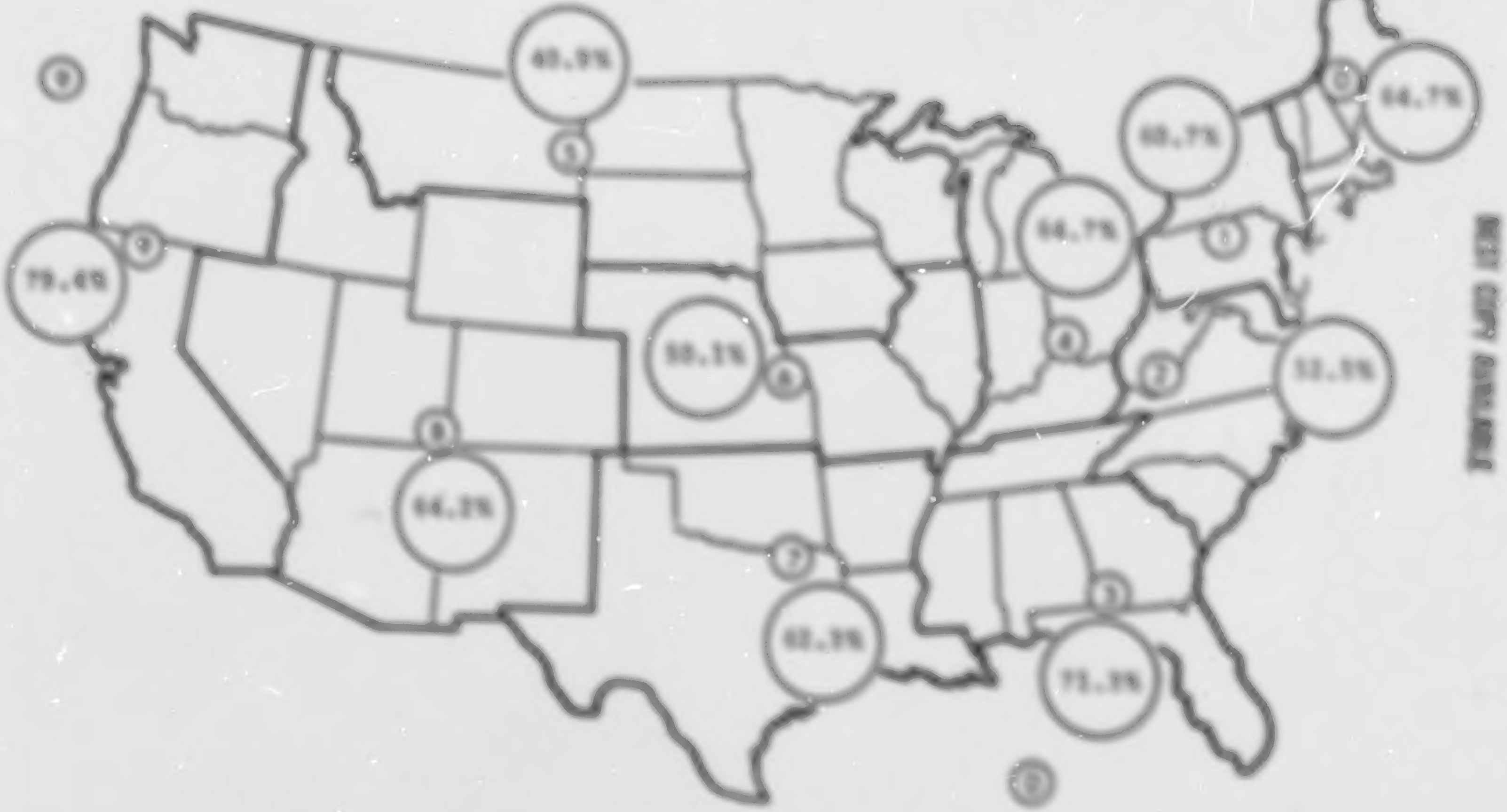
PROPORTION OF CARDIOLOGISTS WITH FELLOWSHIP TRAINING PRACTICING IN AREA WHERE TRAINED
(defined by national zip code area boundaries)

Source: 4

BEST COPY AVAILABLE

FIGURE 3

NATIONAL ZIP CODE AREAS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71.3%
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PROPORTION OF CARDIOLOGISTS PRACTICING
IN AREA WHERE LAST TRAINED
(defined by national zip code area boundaries)

Source: 4

[illegible]

[illegible]

Number of Years	All Programs	Type I Programs	Type II Programs	Type III Programs
	[illegible]	[illegible]	[illegible]	[illegible]
	%	%	%	%
No Answer	[illegible]	[illegible]	[illegible]	[illegible]
One	[illegible]	[illegible]	[illegible]	[illegible]
Two	[illegible]	[illegible]	[illegible]	[illegible]
Three	[illegible]	[illegible]	[illegible]	[illegible]
Over Three	[illegible]	[illegible]	[illegible]	[illegible]

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Source: [illegible]

the requirements for Board Certification in Internal Medicine before beginning their cardiovascular disease training.

The time spent by trainees in cardiology training programs varies, in part, depending upon the career objectives of the trainee. A minimum of two years of training in cardiology is required for Subspecialty Board Certification in Cardiovascular Disease. Approximately [illegible] percent of the training programs provide two years assuming they will meet their candidates in the level of Subspecialty Board requirements. The average number of hours offered or required by broad categories in the two year programs are shown in Table [illegible].

According to estimates made by cardiology training program directors, the majority of their trainees received sufficient training to perform adequately in these areas. There are differences in skills acquired according to whether the training is for one year or for two years. Table [illegible] indicates the percentage of program directors who estimated their trainees had the skills upon program completion.

It is clear that training differences existed between some programs in regard to content. Some of these differences are shown in Figures [illegible], [illegible], and [illegible] which display the frequency distribution curves for cardiac catheterization, electrocardiography, and echocardiography. Such data are valuable in determining that many training programs are providing proper experiences in the different categories considered to be important.

FACULTY IN CARDIOLOGY

In [illegible] the average training program had [illegible] full-time professional staff members and [illegible] part-time staff members, primarily in the division of cardiology, contributing directly to the program (Table [illegible]). In addition, there were [illegible] full-time and [illegible] part-time staff members, primarily in other divisions, who also contributed to the program. Thus, the faculty personnel involved in training programs was considerable with [illegible] cardiologists, full-time and part-time, primarily in the cardiology divisions, who devoted part of their time to the training of [illegible] trainees.

The full-time staff devoted from [illegible] to [illegible] percent of their professional time to the cardiology training program. The findings were as follows:

Program Directors	[illegible] percent
Associate Directors	[illegible] percent
Cardiology Staff	[illegible] percent
Non-Cardiology Staff	[illegible] percent

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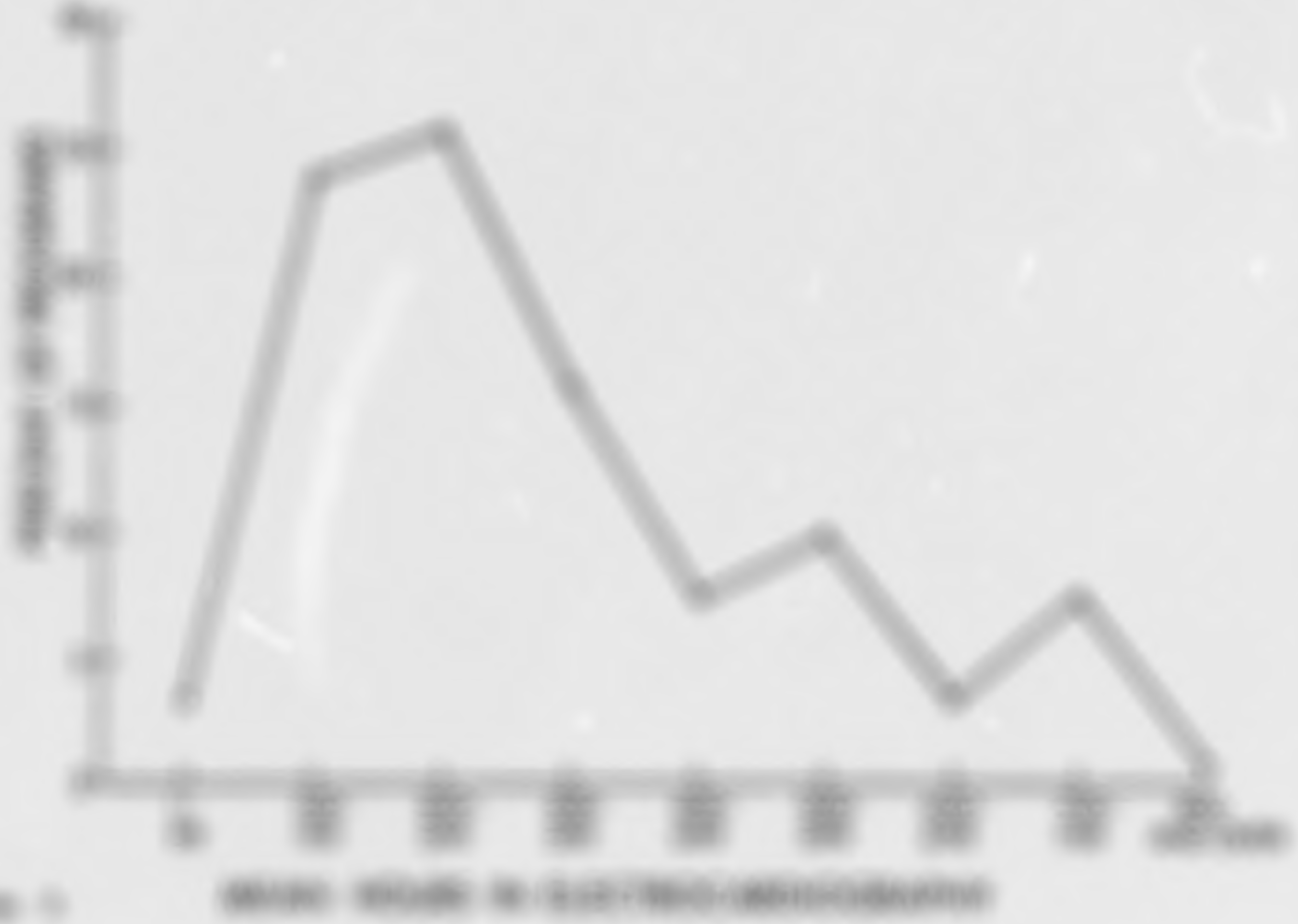

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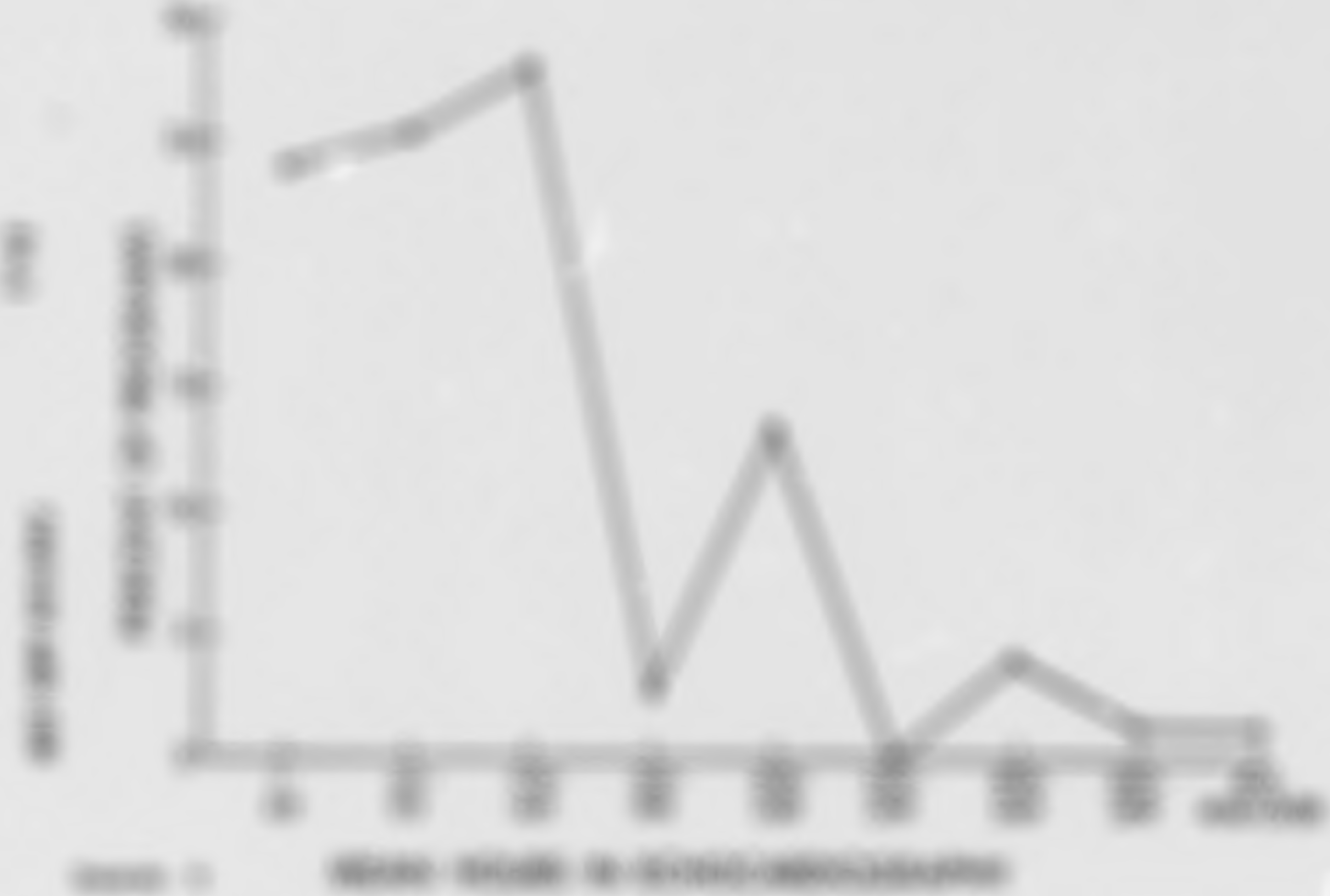


TABLE 5

NUMBER OF PROFESSIONAL STAFF IN CARDIOVASCULAR DISEASE TRAINING PROGRAMS

Staff by Division	Mean/Program	Total Programs (N=329)
Primarily in Cardiovascular Division		
Part-Time	3.71	1220.8
Full-Time	4.69	1513.4
sub-total		2734.0
Primarily in Other Divisions		
Part-Time	1.82	598.8
Full-Time	1.91	628.4
sub-total		1227.2
TOTAL		3961.2

Source: 4

The numbers of faculty per program are means. Thus, some programs may have as many as 21 faculty, while others may have no full-time faculty. In fact, about 5 percent of the training programs had no full-time faculty!

A shortage of faculty appears to exist in some training programs. Twenty-nine percent of the 329 programs had an average of 1.87 staff positions budgeted but unfilled - a total of about 150-180 positions. It is evident, however, that the majority had adequate faculty, since program directors indicated that with their existing facilities and staff they could accommodate an additional 665 trainees if funds for trainees were available.

The staff of most training programs were highly qualified. As an average, 69 percent of the full-time staff were Board Certified in Internal Medicine, and 25 percent were certified in the Subspecialty Board in Cardiovascular Disease.

Training program directors estimated that an average of 2.63 additional staff positions will be required from 1973 to 1978 if they are to increase their trainee capacity by 58 percent over that period. This represents a total estimated five year increase in staff of between 800 and 850. These figures do not include additional staff needed for new programs that might start during this time period, and it assumes that existing programs will continue.

FACILITIES AND MATERIALS

Important elements in a cardiology training program are the numbers of cardiac patients seen: in the hospital, in the outpatient clinic, and in the various cardiovascular laboratories. Table 6 shows the mean values for some aspects of the above, obtained from the questionnaire to the training program directors. These statistics are means for all hospitals and for all training programs. While variation was large, the statistics are broadly descriptive of overall resources.

Table 7 shows the mean percentage of outpatient and inpatient visits per year by general diagnosis. As would be expected, coronary, hypertensive, and rheumatic heart disease were the most common problems seen.

Ninety-four percent of the program directors indicated that they had facilities for research. In 40 percent, the research was clinical; in 5 percent it was basic; and in 55 percent it was combined.

On an average, each training program performed 583 cardiovascular surgical procedures per year. The percentages by major category were as follows: coronary 36 percent, valvular 25 percent, peripheral vascular 23 percent, congenital 13 percent, and others 3 percent.

TABLE 6

Hospital Facilities and Laboratory Services for the Average Cardiovascular Training Program

Facilities and Services	Mean Number
Inpatient Beds	
General Medicine	204
Cardiac Medicine *	22
CCU or ICU	19
Cardiac Surgery	13
Inpatient Admissions per Year	
General Medicine	4,936
Cardiac Medicine	1,561
CCU or ICU	838
Cardiac Surgery	583
Outpatient Services	
General Medicine Visits per Year	23,106
Cardiac Medicine Visits per Year	2,712
Laboratory Procedures per Year	
Angiograms	555
Cardiac Catheterizations	368
Echocardiograms	162
Electrocardiograms	21,264
Exercise Tests	315
Vectorcardiograms	291

* These beds are not necessarily segregated beds on a separate cardiology service, but include segregated beds as well as beds on a general medical service which are occupied by patients with primary cardiac problems being evaluated by the cardiology service. These figures may underestimate the number of beds, since some program directors only included segregated beds in their report. No data are available regarding the number of training programs that have segregated beds or separate designated cardiology service beds.

Source: 4

TABLE 7

PERCENTAGE DISTRIBUTION OF PATIENTS SEEN BY CARDIAC DIAGNOSIS IN TRAINING PROGRAMS

Cardiac Diagnosis	Percent of Cardiology Outpatient Visits per Year	Percent of Cardiology Inpatient Visits per Year
Hypertension	20	16
Rheumatic	18	14
Congenital	7	4
Cardiomyopathy	7	6
Coronary	39	47
Peripheral vascular	4	6
Other	5	7

Source: 4

TRAINING MANPOWER

It is evident that training programs in the United States have been expanding over the past several years (Figure 7). Continued expansion would no doubt have occurred if the funding policies in effect prior to 1973 were continued. Present program directors estimate that their cardiology programs could accommodate 58 percent more trainees over a five-year period if appropriate funds for this expansion were available.

Thus, it can be estimated that if appropriate funds were available, by 1978 a total of 1,250 to 1,300 cardiologists could complete their training that year. This estimate does not include trainees from new training programs that might be started after 1973, and it assumes that existing training programs would continue.

Two-thirds of the present programs (1972-73) could accommodate an average of 1.7 additional trainees in the first year with their existing staffs and facilities if trainee stipends were available. Thus, an estimated 200 additional physicians could be added immediately to existing training programs. Increases beyond this level would require additional funding for program staffs, trainee stipends and training facilities.

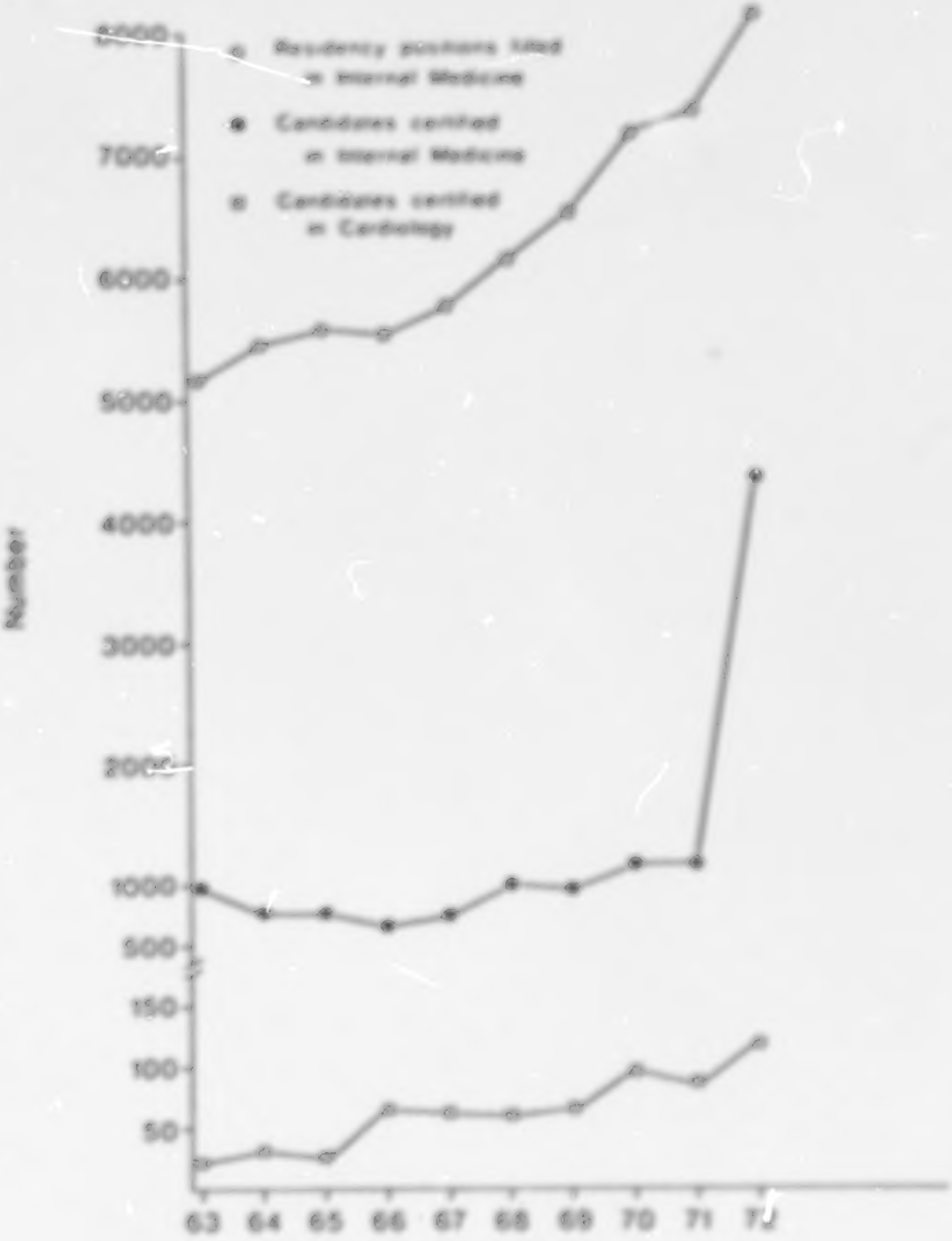
FUNDING FOR TRAINING IN CARDIOLOGY

It was difficult to get a valid picture of how most cardiology training programs were supported. Fifty-seven percent of the program directors indicated they received support from their own institution; 27 percent received support from the National Heart and Lung Institute; and 24 percent received support from their local heart association. As might be expected, research support was reported from many sources.

ADEQUACY OF TRAINING PROGRAMS FOR CURRENT PRACTICE NEEDS

This question can be answered by examining what cardiologists do in practice and what present training programs provide. This comparison has certain limitations, however. While a cardiologist in practice may perform few angiograms or cardiac catheterizations, he must understand the indications for and risks of these procedures and be able to evaluate the data from these studies. Thus, the fact that cardiologists in practice perform few such specialized studies should not indicate that less time should be devoted to such techniques in the training program. For this reason, a second type of evaluation is also presented in this report - how do cardiologists in practice evaluate their own training in terms of deficiencies and redundancies? The answers to these questions are presented in the next chapter on "Continuing Education, Educational Needs and Standards."

FIGURE 7



TEN YEAR TREND IN NUMBER OF
INTERNAL MEDICINE RESIDENCIES, INTERNAL MEDICINE
CERTIFICATES, AND CARDIOLOGY CERTIFICATION*

*Reference source: American Board Internal Medicine

Are these needs being met by current training programs realizing that the cardiologists responded in terms of the training they received five to ten years ago? Only a very general speculation can be permitted on this point. It is clear that cardiologists believe that electrocardiography was an adequate part of their training experience five to ten years ago. It is unlikely that there is less electrocardiography in present training programs, and the general experience is that more electrocardiography is currently being offered considering the rapid increase in electrocardiograms performed in all cardiology programs over the past five to ten years. It is also evident that five to ten years ago very few non-invasive studies (phonocardiograms, echocardiograms, exercise tests) were done. In present programs the fact that more time is spent on these non-invasive techniques than on electrocardiography supports that this deficiency has been corrected in present training programs.

SUMMARY AND RECOMMENDATIONS

There are 329 programs in the United States which offer at least one year of organized training in cardiology in an approved internal medicine training program. These programs have an average of four trainees per program. Approximately 711 trainees completed their training in 1972 and 781 trainees did so in 1973. Most of the trainees will be Certified in Internal Medicine and approximately 15 to 20 percent will become certified in Cardiovascular Disease. Approximately two-thirds of the trainees plan to enter private practice, while one-third plan careers in academic medicine.

Training facilities in the United States have expanded over the past ten years, and, based on training directors' estimates, will continue to do so. It is possible to take on 50 percent more trainees during the next five years. Clearly, to achieve this would require increased funding. These training programs could accommodate 200 more trainees at the present time without additional faculty or space.

The average cardiology training program has 4.6 full time and 1.7 part-time professional staff in the cardiology division contributing to the training program. In addition, there are 1.9 full-time and 1.8 part-time staff from other divisions who contribute to the program. The full time professional staff is highly qualified. A shortage of staff members presently exists in many training programs. Twenty-nine percent of programs have an average of two staff positions budgeted but unfilled - a total of approximately 150-180 positions. If training programs expand over a five-year period from 1973-1978 to increase the number of trainees by 50 percent, an average of 2.43 additional staff members will be required for the average program. This is an increase of approximately 800-850 new staff members.

Trainees entering training programs have had either two years of prior training in internal medicine (49 percent) or three years of training (46 percent).

Most training programs offer experience in all areas required for certification by the Subspecialty Board in Cardiovascular Disease, and the practice of modern cardiology in the office or institutional setting. Some programs do not provide a complete experience in all areas, however.

Our recommendations are:

1. The present system for training of cardiologists in the United States should be continued, taking into account the recommendations of the Subspecialty Board in Cardiovascular Disease.

2. Federal support for training certain groups of cardiologists particularly the Academic Cardiologist (Primary Institutional), should be continued at a rate commensurate with population changes and national demands for trained cardiologists. These training programs for the Academic Cardiologist should be smaller in number but better in quality and more comprehensive in nature than the programs available for the General Cardiologist (Secondary Non-Institutional) or the Clinical Cardiologist (Primary Non-Institutional).

3. The cardiology training needs of internists and generalists (Secondary Non-Institutional) should be continually evaluated and their training modified accordingly. Evidence regarding the number of patients seen by these physicians and the diversity of their problems indicate a clear need for comprehensive cardiovascular training for these specialists.

4. Programs need clear differentiation as to which of the four types of cardiologist is being trained, with the numbers trained adjusted to geographic-area needs. This implies a level of program planning not currently practiced but one which, nevertheless, is required if the minimum ratios of cardiologists to population discussed in Chapter 7 are to be realized.

5. Directors of cardiology training programs should receive continuing information as to the needs of their graduates including:

    a. a copy of this study report;

    b. a report from the American Board of Internal Medicine regarding areas of deficiency in cardiovascular training based on the results of examination of their trainees;

    c. an annual meeting with the other directors of similar programs.

In making these recommendations, we do so fully cognizant of the fact that significant changes were underway at the time the study was being done, the effect of which has not finished, cannot be ascertained at this time. In essence, we assumed a "steady state" of federal support to many facets of the training programs which may or may not be forthcoming in the future. It is one thing to imply that hospitals can pick up certain costs; it is quite another to demonstrate that this might happen.

Currently, medical schools and teaching hospitals supporting cardiology training programs rely heavily on government funding. We have not assessed alternative approaches to federal support as part of this study, although the need for such consideration is fully acknowledged. Furthermore, there is a need for federal funding to provide support for basic science research and teaching in keeping with the significant advances in this area. This component will not adequately be available from the clinical faculty of the hospital but must be provided by medical school academic cardiologists.

Cardiovascular training programs receive considerable clinical, teaching and research support from such disciplines as surgery, radiology, physiology, pharmacology, biomedical engineering. Although these fields have not been surveyed by this study except as contributing resources to the training profile, their contributions are large and important. These disciplines owe their tremendous advances and expansion in recent years in part to federal support. The types of training programs recommended presuppose their continued involvement, if not increased participation. Manpower needs in these related fields, though not included in this study, are critically important to cardiology.

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3. The percentage of cardiolosits who attend no cardiovascular course or meetings ranges from 1-17 percent, depending upon the subgroup. The average would appear to be less than 10 percent.

4. Approximately 75 percent of the cardiologists believe the opportunities offered are adequate.

An important factor affecting the continuing educational needs of the cardiologist could be his original training experiences. Tables 4 and 5 contain the responses to the statement "Training in this Topic Too Limited--". It is apparent that:

1. Many cardiologists believe they received inadequate training experience in : pediatric cardiology (47 percent); phonocardiography (41 percent); echocardiography (74 percent); vectorcardiography (55 percent); coronary angiography (50 percent); biochemistry (46 percent); physiology (43 percent); biostatistics (59 percent) and bioengineering (65 percent).

2. Differences between the subgroups varied considerably in a number of areas: phonocardiography (29-59 percent); echocardiography (60-96 percent); coronary angiography (29-76 percent) and bioengineering (53-86 percent).

By examining the responses of cardiologists who indicate (1) their training was "too limited" and (2) such training is of either "medium" or "high" importance for the training of physicians going into cardiological practices similar to theirs, a measure of training inadequacy or insufficiency is obtained. From this perspective, training was seen as insufficient by over one-third of the respondents in the following areas:

Area	Percent
CPC Pediatric	34
Pacemaker follow-up	35
Echocardiography	55
Vectorcardiography	34
Coronary angiography	42
Peripheral angiography	39
Swan-Ganz right heart catheterization	44
CV biochemistry	38
Pulmonary physiology	40
Biostatistics	39
Bioengineering	41

TABLE 4

PERCENTAGE OF CARDIOLOGISTS INDICATING TRAINING TOO LIMITED

Type of Training	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Secondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
Experience in Clinical Care, Research and Teaching									
Cardiac Patient Care:									
Pediatric	47	47	32	55	44	48	43	47	57
Medical	10	3	4	1	10	2	11	6	17
Surgical	35	33	34	33	36	25	35	29	46
Coronary Care Unit	30	20	44	17	33	22	27	27	50
Pacemaker Insertion	32	11	41	24	50	17	42	32	70
Cardiovascular Research:									
Basic	31	29	29	40	30	26	27	27	42
Clinical	26	28	23	28	20	21	25	29	31
Laboratory Diagnostic Techniques									
Electrocardiography	11	11	9	7	15	8	9	8	16
Phonocardiography	41	31	29	33	35	30	46	36	59
Echocardiography	74	61	70	60	71	72	75	78	96
Exercise Tolerance Testing	32	32	33	35	35	34	23	32	37
Vectorcardiography	55	48	50	58	55	50	52	55	70
Angiography:									
Cardiac	30	9	34	25	39	14	32	27	61
Coronary	50	29	60	44	49	39	68	54	76
Peripheral	55	50	50	56	53	53	44	53	69
Cardiac Catheterization	26	7	22	25	42	13	32	26	48

Source: 5

TABLE 5

PERCENTAGE OF CARDIOLOGISTS INDICATING TRAINING TOO LIMITED

Laboratory and Classroom Instruction	All	Institutional				Non-Institutional			
		Primary		Secondary		Primary		Sedondary	
		Under 40	Over 40	Under 40	Over 40	Under 40	Over 40	Under 40	Over 40
C-V Anatomy	31	37	38	42	35	36	29	28	26
C-V Physiology	25	22	26	27	33	27	18	24	29
C-V Biochemistry	46	50	54	44	59	45	47	35	44
C-V Pathology	28	40	21	43	27	34	27	25	24
C-V Epidemiology	39	54	50	57	33	41	38	31	32
C-V Pharmacology	30	35	28	35	35	25	28	22	33
C-V Radiology	28	26	22	33	31	30	26	31	32
Pulmonary Physiology	43	47	39	50	34	40	42	38	49
Hypertensive Renal Disease	25	39	29	30	18	29	21	18	22
Peripheral Vascular Disease	34	60	29	35	32	40	32	32	28
Cerebral Vascular Disease	32	56	39	28	41	46	29	24	22
Biostatistics	59	60	59	63	64	58	60	44	63
Bioengineering	65	53	56	67	77	55	65	55	86

Source: 5

The majority are in newly differentiated areas. Echocardiography training was found inadequate by over one-half of those responding.

Another important factor effecting the continuing educational needs of the cardiologist could be the role of certification and recertification in our future national health care system[2]. It has recently been recommended that "the feasibility of recertification, relicensure, and the use of a scheme of incentives as a mechanism for motivating physicians to maintain a high level of professional competence should be exploited"[3]. At the present time, less than 66 percent of all cardiologists have their boards in internal medicine, and less than 15 percent are certified in cardiovascular disease. If the requirements for practicing cardiology were made more stringent, it is likely that a large number of individuals would need to have future training and course work in order to demonstrate competence in the field. The Physician Reassessment Test Program currently being jointly developed by the American College of Cardiology and the American Heart Association could be of assistance in identifying for the cardiologist his areas of strength and weakness, thus pinpointing for him which courses might be most valuable to him.

COMMENTS OF CARDIOLOGY TRAINING PROGRAM DIRECTORS REGARDING EDUCATIONAL NEEDS

As one of the groups most involved in the continuing education of the cardiologist, the comments of the training program directors seem quite relevant. Many directors recognize the need for varying levels of training and course work in order to fit the varying roles and levels of competence required to practice cardiology. Thus not all cardiologists need to be trained in a similar fashion. A number of training program directors strongly recommend physician assessment tests and recertification; some even recommended that these be required now by all cardiologists.

Many of the directors of larger training programs believed one of the major problems was stable and adequate funding of their programs. A number stated they needed additional faculty.

For many of the smaller training programs, a frequent point raised by the directors centered around the need for pooling of the teaching resources. By this, they meant patient material, types of procedures available, and audio-visual facilities particularly in the basic sciences. In regard to this latter point, the need for a core curriculum was frequently expressed. Several program directors suggested the need for a separate television channel for physicians, particularly for showing national scientific meetings.

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[2] Building a National Health-Care System. Committe for Economic Development, 477 Madison Ave., New York, N.Y., 1973.

[3] Ibid.

SUMMARY AND CONCLUSIONS

The continuing educational needs of the cardiologists are currently varied and diverse. They appear to be influenced by:

1. The type and content of his original training
2. The role and age of the cardiologist

In the future, continuing educational needs will be influenced by:

1. The role of certification and recertification in a national health care system
2. Regional considerations
3. Advances in medical knowledge
4. Stable funding

CHAPTER 7

FUTURE MANPOWER NEEDS IN CARDIOLOGY

Walter H. Pritchard and Walter H. Abelmann

INTRODUCTION

Evidence obtained from our study suggests that a laissez-faire or unplanned medical system results in wide variations, inequalities and inadequacies in the distribution of physician specialists including cardiologists. The inadequacies of past planning for health manpower raise serious questions about traditional approaches to manpower studies and predictions for the future. On the other hand, Badgley and co-workers[1] recently critically reviewed six methods of assessment and projection of needs for health manpower. They are: (1) Health Personnel/Population Ratio; (2) Demographic Projection; (3) Need for Health Services; (4) Supply and Demand; (5) Functional Analysis; and (6) Target-Setting Approach.

The method used by us to assess manpower needs in cardiology is that of analyzing the number of active cardiologists available for patient care per 100,000 population (Health Personnel/Population Ratio). This has provided a figure from which correlations of different kinds have been made. Such physician ratios per 100,000 population can also be used to estimate future needs. The major limitation of this approach is that it is based on a ratio for which scientific and technical advances, changing demands and expectations are not taken into account.

MANPOWER NEEDS BASED ON CHANGES IN CARDIOLOGIST/POPULATION RATIO

The overall ratio of cardiologists to population in the United States is 5.1/100,000 (Table 7, Chapter Three). In one census division, the ratio is as high as 8.0/100,000. If one assumes that the population will increase at the rate of 1 percent per year, projections of the manpower needs in cardiology can be made for following years using various ratios of cardiologists/100,000 population. Table 1 shows such projections by census division through 1976 using ratios of 5,6, and 7 cardiologists per 100,000 population in all census divisions. Losses to the population of cardiologists from deaths and from retirements are estimated by using factors discussed in detail in Chapter Eight. An assumption is made that the cardiologist over 65 will have a decreasing activity rate as a cardiologist with the passage of time, even though he may classify himself as active. For planning purposes it is estimated that the older cardiologist will

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[1] Badgley, R.F., Bloom, S., Mechanic, D., Pearson, J.C., and Wolfe, S., "International Studies of Health Manpower: A Sociological Perspective", Medical Care, 9:235-252, 1971.

TABLE 1

Projection of Cardiology Manpower Needs: 1972 Through 1976

Census Division	Population (M)	Ratios Per 100,000 Population			
		Present Ratio	Projected Ratios		
			5	6	7
Middle Atlantic	37.2	8.8	---	---	---
New England	11.8	7.8	---	---	---
South Atlantic	30.7	5.6	---	62	368
Pacific	26.5	5.7	---	79	344
Mountain	8.3	4.2	76	157	240
East North Central	40.3	3.8	483	886	1280
West South Central	19.3	3.6	271	464	657
West North Central	16.3	3.4	262	425	588
East South Central	12.8	2.5	321	449	577
Total number needed in 1972			1411	2522	4062
Additional Cardiologists Needed by 1976 due to:					
Population growth @ 1%/year			530	637	743
Death and retirement			1063	1063	1063
Inactivity for over 65 age group			346	346	346
			1939	2046	2152
Total Additional Manpower Needs Through 1976			3350	4568	6214
Active cardiologists through 1976			12632	13850	15496

be 73 percent active.

Thus, if we had brought all regions of the country up to a ratio of six cardiologists per 100,000 population (in 1970), we would have required 2,[illegible] more cardiologists than we had. When we project ahead through the year 1976 taking into account population growth, death and retirement, and inactivity of cardiologists over 65 years of age, 3,[illegible] additional cardiologists would be required making a total of 8,[illegible] needed.

If numbers of cardiologists and not their practice location are the only concern then 8,300 cardiologists could be produced in a little over five years' time with either an annual graduate output of 800 or with an incremental increase per year of about 15 percent. The estimate of 8,300 required was made under the theoretical assumption that these individuals would be distributed where they were needed. Clearly, two additional factors affect the time when the proposed ratio might actually be achieved:

1. The classes of 1971-72 and 1972-73 have graduated and are in practice at this time. It is not known where they are practicing but in all likelihood they are disproportionately clustered in areas which have cardiologist to population ratios well above 6.3 per 100,000.

2. With the 1971-72 and 1972-73 graduates already "in place", achieving the suggested national norm of at least 6.3 per 100,000 in all census divisions will require at least one year and possibly more than the five indicated in the analysis.

From the Cardiovascular Training Program Questionnaire of 339 institutions providing one or more years of training in cardiology, it was determined that they had 1,279 trainees. It was also estimated that approximately 600 will complete their training each year. However, to meet the additional manpower requirements of 8,300 cardiologists by 1976 estimated above, it would require an increase of 100 to 800 for the number completing training each year. Since the training program directors indicated that they could accommodate 30 percent more trainees if adequate funding and staffing were available, we probably have adequate facilities for training cardiologists at the present time.

MANPOWER NEEDS AND TRAINING PROGRAMS FOR DIFFERENT TYPES OF CARDIOLOGISTS

In estimating the total numbers needed by using the ratios of cardiologists per 100,000 population, no consideration was given to the medical needs of cardiology or to the types of cardiologists to be trained. From the profile studies of the cardiologists' roles, four types of cardiologists were identified:

Internist Cardiologist = Non-Institutional, Secondary

Clinical Cardiologist = Non-Institutional, Primary

Cardiac Specialist = Institutional, Primary

Academic Cardiologist = Institutional, Secondary

If we now look at training needs and projections in terms of these categories, the problem can be brought into sharper focus.

Internist-Cardiologist (Non-Institutional, Secondary)

The Internist-Cardiologist will provide general medical and cardiac care for most of his patients, but will rely on Cardiac Specialists for support in the more complex cardiac problems. He will be familiar with diagnostic ECG, acute infarction and will function as a primary physician but at a higher level than the generalist. There are presently approximately 330 training programs in internal medicine. The Internist-Cardiologist could receive his training in a program of internal medicine if it were to include sufficient clinical cardiology embracing the problems of hypertension, coronary care, ECG X-ray interpretation, etc. A three year program in internal medicine should include at least six months in cardiovascular diseases. Thus, his particular forte would be to be aware of, and concerned with, the relatively routine management of common cardiac conditions and to become a competent electrocardiographer with skill levels in these areas in excess of the average internist. He should have considerable exposure to the use of drugs in the management of heart disease particularly diuretics and anti-arrhythmic agents. He would acquire these specific skills by an extended activity in the heart station and in a coronary care unit. If his program in internal medicine cannot offer at least six months in cardiology, he should have a year of cardiology training elsewhere to insure competence in this area.

The number of Internist-Cardiologists should be large. Approximately 4,000 physicians are currently identified in this particular role and more might be needed. Improved programs in Internal Medicine could reduce the number of special cardiology training programs required. Since these programs are now financed by hospitals, they should not require government support.

Clinical Cardiologist (Non-Institutional, Primary)

This cardiologist is usually non-institutionally based but may be in an institutional setting and, in that event, will see a substantial number of referred cardiac patients from the institution. He will spend more time in consultation, may participate in the interpretation of electrocardiographic records in a more formalized institutional department, and

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The number of Clinical Cardiologists [illegible]

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significant regional differences exist in death rates from cardiovascular disease[2]. Thus, for example, the death rates for coronary heart disease for white males aged 45 to 64 years are highest in the Middle Atlantic region, followed by the rates for the South Atlantic and New England regions, and are lowest in the Mountain region[3], thus paralleling the distribution of cardiologists. On the other hand, the death rates from hypertensive disease are highest in the South Atlantic and East South Central regions, for both whites and non-whites, in no evident relation to distribution of cardiologists[4].

The question is--can one be assured that the projected numbers of cardiologists to be trained will locate in the areas of regional need? How can one prevent the North East and Middle Atlantic areas from further increasing their supply while at the same time be assured that other areas such as the East South Central will gather enough for its requirements? This is a fairly crucial question, but until national goals of distribution are set and methods to implement them developed, the present conditions will continue to operate to the disadvantage of the deprived areas and thus further aggravate the present situation.

It has been stated recently that location of doctors may be more directly related to a state's per capita income regardless of the presence of medical schools in the area. The finding that many states with higher per capita income have more doctors per 100,000 people than states with more medical schools could ease the agitation in some areas for the establishment of more schools to produce more physicians. If this be true, then improvement of per capita income of the states may be more important than additional medical schools to provide the attraction for physicians.

SUMMARY AND RECOMMENDATIONS

1. On the basis of a cardiologist to population ratio of 6 per 100,000, it is projected that approximately 4,600 more cardiologists are needed in the five year period ending December 1976.

2. Four functional types of cardiologists are identified and their suitable numbers and their training needs are suggested.

3. The problem of maldistribution and some factors altering the projected needs are briefly discussed.

4. The standards for cardiovascular diagnosis and surgical centers developed by the American Heart Association and the Inter-Society Commission for Heart Disease Resources should be implemented.

[2] Moriyama, I.A., Krueger, D.E., and Stamler, J., Cardiovascular Disease in the United States. Harvard University Press, Cambridge, 1971.

[3] Ibid., p. 65.

[4] Ibid., p. 172.

CHAPTER 8

THE ADVISORY COMMITTEE'S DATA BASE

Robert C. Mendenhall and the USC DRME Staff

INTRODUCTION

The discussions in the preceding chapters were necessarily selective. The Advisory Committee, assisted by USC DRME, worked with technical reports and analyses relating to each of the study's surveys and prepared the discussions deemed appropriate for a final report. In this chapter, the statistical tables and findings which support the preceding discussions are presented. However, data presented in earlier chapters are not repeated here unless their omission would create obvious gaps in the presentation. With these data and those presented in the previous chapters, the reader has access to all data believed to be important in the particular topical areas.

Data will be presented as they were obtained through each of the study phases. They will be presented for each of the survey instruments without regard to their application to any one of the study's research objectives. Integration of data obtained from the studies as it pertains to a research objective has been made in the Advisory Committee's presentations. Discussion will be limited to that necessary for an understanding of the data presented in a table or a series of tables. The utility of certain data will be noted as well as their limitations.

USC DRME CARDIOLOGY PROJECT STAFF

Many individuals within DRME and in organizations across the country performed important roles for this project. Some were involved almost continuously (as the DRME Staff), others assisted in a technical review capacity, and still others made the resources of their particular organization available as the study needed information. The list of individuals which follows is by no means exhaustive; rather it singles out those whose involvement was essential or whose contribution made a marked impact on the chapter and quality of the project.

Beginning with individuals not part of the DRME:

> Hilmon Castle, M.D., Chairman, Department of Family Medicine, University of Utah School of Medicine, contributed as a cardiologist, evaluator and physician who understands the characteristics of both small urban area and rural medicine. Many useful ideas regarding the design of study instruments were obtained from him.

George Mixter, M.D., Department of Medical Education, American Medical Association, assisted in the design of the Cardiovascular Training Programs Survey and made his resources regarding training programs available to us.

Cameron Brown, Department of Medical Education, American Medical Association, assisted with the location of those institutions which train cardiologists.

James Haug, Survey Research Center, American Medical Association, provided the physician biographical data and address information which constituted the source listing for over 95 percent of the physicians in the study. These data permitted comparisons which were important methodologically and practically. He and his staff made useful recommendations regarding content of study instruments as well.

Gene Roback, Survey Research Center, American Medical Association, reviewed study designs and provided extensive physician data. She was a ready and responsive source of information whenever requests were made.

Donald T. Fredrickson, M.D. and Irving S. Wright, M.D., Inter-Society Commission for Heart Disease Resources, were particularly helpful during the early months of the study in assessing the adequacy of existing statistics regarding cardiovascular disease and reports related to standards in cardiology.

David S. Blankenhorn, M.D., Professor of Medicine and Chief of Cardiology, USC School of Medicine, participated in study design plans and made his staff available for whatever pre-test activities were needed.

Francis Y.K. Lau, M.D., Professor of Medicine and Chief of Cardiology, Los Angeles County/USC Medical Center, was an active partner in all design, testing and analysis phases for the project. Dr. Lau's contributions to the Cardiology Professional Diary and the Cardiovascular Training Programs Survey designs were particularly important.

The DRME Staff participants:

Judilynn T. Foster, Ph.D., provided evaluation consultation and considerable encouragement at important study decision points. She developed the original DRME proposal and general design for the study.

Data preparation, statistical design, programming and computer processing was the responsibility of Roger A. Girard, Ph.D. In addition, he worked as a daily partner in formulating analysis plans and in assessment of the data which were generated by those plans. Richard Neville, M.A., was equally involved in these activities. He worked closely with the analysis staff in formulating the specific statistical analyses and performed the necessary programming to accomplish them.

Individuals who worked in conceptual design areas, in study field testing, in analysis planning and in actual analysis and interpretation of results were with the project almost totally for no less than a year and in most instances for the entire time period.

Sharon Perrott, M.A., participated in the last three studies and had a major role in the log-diary analyses as well as the preparation of this report.

Kathryn McCreary, M.A., contributed to all study phases with primary responsibilities for the manpower reports.

Dana Rico, M.S., contributed to each of the study phases, particularly the log-diary phase.

Beth Augsburger, M.S., participated in both training studies with a primary involvement in the study addressed to cardiologists.

Brenda Svenberg, participated in the initial cardiology survey and the data preparation activities for each of the studies.

Technical editing assistance and advice regarding level of detail for reporting was given by Muriel Wolkow, M.A.

Data preparation activities were extensive. Data had to be checked, coded and then prepared for eventual computer processing. Those primarily involved in this activity included:

Phillip Abrami
Deborah Abrami
Monica Johansson
Jeff Mendenhall
Dorene Weinstein
Stuart Wilbur

The secretarial staff under Maria Radovitch has been outstanding. Those who were most involved in this work include:

Roberta Natochka
Monica Johansson
Angela Crow
Sherry Rodhouse

The Instructional Media Staff under William L. Millard, M.D., readily accommodated the project's demands for graphic works. Lynda Dummel, Dan Garcia and their artists did the countless art work and design tasks which were required.

CURRENT CARDIOLOGY MANPOWER AND ITS DISTRIBUTION

The tables and figures contained in Chapter Three were compiled from (1) statistics obtained through the Initial Cardiology Survey, (2) the "master file" of all eligible cardiologists, (3) the American Medical Association's statistics regarding physician distributions by type of specialty, (4) the U.S. Bureau of the Census, U.S. Census of Population: 1970 and (5) Rand-McNally's ZIP Code Atlas: 1969. Data generated in this study were always used in preference to data from other sources. Secondary corroborative statistics (such as from the American Board of Internal Medicine) were used as appropriate and are clearly so designated when used. Table 1 presents distributive statistics for physicians as of December, 1971.*

Statistical tables used by the Advisory Committee, but not included in their discussion chapters, pertain to distributions by community size, practice arrangements, age groupings and certification. They are included here with limited discussion for the reader who desires additional information.

Table 2 presents distributions for Primary Cardiologists and Secondary Cardiologists by community size.

The practice arrangements selected by cardiologists are summarized in Table 3. This table gives distributive statistics for Primary and Secondary Cardiologists by specific practice arrangements under either Non-Institutional or Institutional practice. The distributions in this table are basic to all presentations wherein discussions relate to the combination of Primary or Secondary and Institutional or Non-Institutional. It will be noted that:

- 64 percent of the Primary Cardiologists and 84 percent of the Secondary Cardiologists are in Non-Institutional practice.
- 31 percent of the Primary Cardiologists and 12 percent of the Secondary Cardiologists are in Institutional practice.

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* This table also appears as Table 1 in Chapter Three.

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TABLE 7

AGE-GROUPED DISTRIBUTION OF CARDIOLOGISTS BY CENSUS DIVISION: CARDIOLOGISTS SIXTY YEARS OLD AND OVER

Census Division		Age Groups				Sub Total	Division Total Manpower		
		60-64	65-69	70-74	75 & Over		Age Known	Other	All
New England	N	85	56	23	17	181	819	14	833
	% of Total					22.1	100.0		
Middle Atlantic	N	382	242	153	79	856	2942	56	2998
	% of Total					29.1	100.0		
South Atlantic	N	122	78	39	32	271	1747	26	1773
	% of Total					15.5	100.0		
East-South Central	N	19	18	5	2	44	307	11	318
	% of Total					14.3	100.0		
West-South Central	N	56	27	12	10	105	666	17	683
	% of Total					15.8	100.0		
East-North Central	N	140	74	56	37	307	1511	27	1538
	% of Total					20.3	100.0		
West-North Central	N	41	26	18	13	98	532	25	557
	% of Total					18.4	100.0		
Mountain	N	17	11	8	2	38	324	13	337
	% of Total					11.7	100.0		
Pacific	N	121	63	28	22	234	1495	28	1523
	% of Total					15.7	100.0		
Caribbean	N	3	2	2	1	8	102	1	103
	% of Total					7.8	100.0		
Military APO/FPO	N	0	0	0	0	0	28	0	28
	% of Total					0.0	100.0		
TOTAL	N	986	597	344	215	2142	10473	218	10691
	% of Total	9.4	5.7	3.3	2.1	20.5	100.0		

Source: 1, 2

- South Atlantic has the most favorable profile - 31 percent under 40 and 16 percent over 60. Much of this favorable status is explained by the relatively high concentration of federal physicians within this geographic area.
- All other divisions have proportionately greater numbers under 40 and would thus tend to be in a relatively stable cardiologist manpower position.

One index of manpower stability which could be constructed from these data would consider only the cardiologists under age 60 in the effective manpower ratios. The obverse index would be based on those over 60 and would make the assumption that all of them needed to be replaced in a relatively short period of time. Certainly, manpower projections should not ignore the age-grouped data provided in these tables because longevity in practice is directly correlated with physician age.

Cardiologist's Age and Related Specialty Factors

Age is correlated with whether or not the cardiologist is Board Certified in Internal Medicine and Cardiovascular Disease. Analyses of professional activity data in the section to follow indicate that Certification in Internal Medicine has no greater effect on the characteristics of the cardiologist's practice than being a Primary Cardiologist but that Certification in Cardiovascular Disease has the effect of (1) increasing the number of patients obtained through referral; (2) increasing the range and sophistication of diagnostic procedures actually used and (3) increasing the number of patient encounters which are cardiac rather than non-cardiac as primary clinical problems.

Table 8 provides distribution statistics for cardiologists by practice mode and age groupings for those who are and those who are not specialty board certified. There is a direct correlation between age and certification for the Non-Institutional cardiologists; the younger they are the less likely that they will be certified. This relationship holds for all age groups where it will be noted that for cardiologists over 60, 85 percent are certified. Among Institutional cardiologists, the opposite relationship exists; 30 percent under 40 years old, 19 percent from 40 through 59 years, and 10 percent 60 years or over are certified. A partial explanation for the Institutional distribution may be that the under 40 age group are a group who will, upon completion of their cardiovascular disease training, go primarily into Non-Institutional practice and thus are "cardiologists in transition".

Subspecialty Board Certification in Cardiovascular Disease is presented in Table 9 in the same format as used for Board Certification in Internal Medicine. The direct correlation between age and percentage certified observed for board certification holds in this distribution. For Institutional practices, the two groups under age 60 have comparable distributions.

TABLE 8

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY AGE GROUPINGS AND SPECIALTY BOARD CERTIFICATION STATUS

PRACTICE MODE	UNDER 40 YEARS				40 THROUGH 59 YEARS				60 YEARS AND OVER			
	Not Board Certified		Board Certified		Not Board Certified		Board Certified		Not Board Certified		Board Certified	
	N	%	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL												
Solo	217	18.5	132	16.3	762	50.9	819	35.6	447	77.2	363	58.5
Partnership	148	12.6	180	22.3	195	13.0	434	18.9	42	7.3	72	11.6
Group	137	11.7	167	20.7	165	11.0	426	18.5	31	5.4	71	11.4
Combination (Other)*	42	3.6	23	2.8	48	3.2	91	4.0	16	2.8	19	3.1
Sub Total	544	46.4	502	62.1	1170	78.1	1770	77.0	536	92.7	525	84.6
INSTITUTIONAL												
Hospital	298	25.4	115	14.2	118	7.9	175	7.6	19	3.3	35	5.6
Medical School	162	13.8	95	11.8	106	7.1	204	8.9	5	0.9	20	3.2
Combination (Other)*	60	5.1	32	4.0	25	1.7	62	2.7	2	0.3	6	1.0
Sub Total	520	44.3	242	30.0	249	16.7	441	19.2	26	4.5	61	9.8
OTHER												
Majority Other	110	9.2	63	7.8	67	4.5	83	3.6	16	2.6	29	4.6
Combination (Other)*	1	0.1	1	0.1	12	0.7	6	0.2	1	0.2	6	1.0
Sub Total	111	9.3	64	7.9	79	5.2	89	3.8	17	2.8	35	5.6
TOTAL	1175	100.0	808	100.0	1498	100.0	2300	100.0	579	100.0	621	100.0

Source: 2

TABLE 9

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE: BY AGE GROUPINGS AND SUBSPECIALTY BOARD CERTIFICATION STATUS

PRACTICE MODE	UNDER 40 YEARS				40 THROUGH 59 YEARS				60 YEARS AND OVER			
	Not Certified		Subspecialty Board Certified		Not Certified		Subspecialty Board Certified		Not Certified		Subspecialty Board Certified	
	N	%	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL												
Solo	340	18.1	9	8.3	1498	44.2	83	20.4	723	68.9	87	57.6
Partnership	309	16.5	19	17.4	562	16.6	67	16.5	98	9.3	16	10.6
Group	280	14.9	24	22.0	516	15.2	75	18.5	88	8.4	14	9.3
Combination (Other)*	60	3.2	5	4.6	119	3.5	20	4.9	29	2.8	6	4.0
Sub Total	989	52.7	57	52.3	2695	79.5	245	60.3	938	89.4	123	81.5
INSTITUTIONAL												
Hospital	396	21.1	17	15.6	251	7.4	42	10.3	48	4.6	6	4.0
Medical School	236	12.6	21	19.3	230	6.8	80	19.7	14	1.3	11	7.3
Combination (Other)*	88	4.7	4	3.7	67	2.0	20	4.9	4	0.4	4	2.6
Sub Total	720	38.4	42	38.6	548	16.2	142	34.9	66	6.3	21	13.9
OTHER												
Majority Other	163	8.7	10	9.1	132	3.8	18	4.4	38	3.6	7	4.6
Combination (Other)*	2	0.1	0	0.0	17	0.5	1	0.4	7	0.7	0	0.0
Sub Total	165	8.8	10	9.1	149	4.3	19	4.8	45	4.3	7	4.6
TOTAL	1874	100.0	109	100.0	3392	100.0	406	100.0	1049	100.0	151	100.0

* Age grouped cardiologist include only those whose age is known

Source: 2

Years Since Medical Degree Relating to Certification

The average non-federal cardiologist was 48 years old; the federal cardiologists were seven years younger. In Tables 10, 11, 12 and 13 the relationship of age to Board Certification in Internal Medicine and Subspecialty Board Certification in Cardiovascular Disease is noted.

Years of preparation for practice and the average amounts of time in preparation are noted in the section of this chapter devoted to the Cardiologist's Training Survey data and the Cardiovascular Training Programs Survey data.

General Characteristics of Cardiologists' Practices

The Advisory Committee in approaching the task of defining the roles which cardiologists perform has focused on the activities which characterize different practice modalities. In essence, what cardiologists *do* is the primary categorization factor.

In the preceding section, tables supporting the Advisory Committee's manpower distribution analyses were presented. These included distributions by census division, age and age-related factors, distributions by types of practice and distributions by medical service community size.

In this section, tables are presented pertaining to:

- Patient sources
- Distribution of time to professional activities
- Utilization of specialized skills and knowledge

The tables support the discussion of cardiologists' roles provided in Chapter 4. In the section to follow, comparable data from the log-diary study will be presented. The data have been tabulated in several ways to document the presence or absence of one factor as a primary contributor to the particular statistic.

- Tables 14 through 18 relate to referral
- Tables 19 through 22 relate to distance
- Tables 23 through 26 relate to practice mode
- Tables 27 through 33 present the proportion of time in professional activities

TABLE 10

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR FEDERAL PHYSICIANS: BY SPECIALTY BOARD CERTIFICATION AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-Board Certified	11	129	15	69	12	198
Board Certified	16	163	23	58	18	221
Average Years	14		19		15	
Total Number (N)		292		127		419

Source: 2

TABLE 11

AVERAGE YEARS SINCE DOCTOR OF MEDICINE DEGREE FOR NON-FEDERAL PHYSICIANS: BY SPECIALTY BOARD CERTIFICATION AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

NON-FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL NON-FEDERAL CARDIOLOGISTS	
	Primary Cardiologist		Secondary Cardiologist			
	years	number (N)	years	number (N)	years	number (N)
Non-Board Certified	19	1526	23	1636	21	3162
Board Certified	23	2144	25	1575	24	3719
Average Years	21		24		22	
Total Number (N)		3670		3211		6881

Source: 2

TABLE 13

[illegible]

FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				ALL FEDERAL PHYSICIANS	
	Primary Classification		Secondary Classification			
	years	number (N)	years	number (N)	years	number (N)
Non-subspecialty Certified	15	263	16	118	15	380
Subspecialty Certified	18	60	20	9	19	69
Average Years	16		16		16	
Total Number (N)		323		127		449

Source: [illegible]

TABLE [illegible]

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NON-FEDERAL PHYSICIAN CLASSIFICATION	SPECIALTY				All Non-Federal Classifications	
	Primary Classification		Secondary Classification			
	years	number (N)	years	number (N)	years	number (N)
Non-subspecialty Certified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subspecialty Certified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average Years	[illegible]		[illegible]		[illegible]	
Total Number (N)		[illegible]		[illegible]		[illegible]

Source: [illegible]

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TABLE 19

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN: CENSUS DIVISIONS BY SPECIALTY

CARDIOLOGY SPECIALTY	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Primary Cardiologist Distribution (N)	3602	294	963	570	121	249	500	182	136	546	38	3
Mileage:												
less than 5	36.8	39.1	46.1	35.6	24.1	28.5	31.6	21.6	37.0	36.3	42.8	20.7
5 to 25	49.5	50.3	47.3	48.5	50.[illegible]	48.7	54.0	44.5	46.3	52.4	49.5	59.0
over 25	13.8	10.6	6.6	15.9	25.8	22.8	14.4	33.9	16.7	11.3	7.7	20.3
Secondary Cardiologist Distribution (N)	3004	226	798	521	98	186	454	172	90	426	22	11
Mileage:												
less than 5	46.4	53.4	55.0	43.3	31.4	38.5	[illegible].8	36.3	48.0	45.5	38.6	46.8
5 to 25	47.6	42.7	42.2	49.8	55.1	49.7	52.6	49.2	45.6	49.3	52.8	36.4
over 25	6.0	3.9	2.8	6.9	13.5	11.8	4.6	14.5	6.4	5.2	8.5	16.8

Source: 2

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TABLE 20

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN: CENSUS DIVISION BY BOARD CERTIFICATION

BOARD CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Board Certified Distribution (N)	3630	302	919	615	120	230	536	196	138	542	23	9
Mileage:												
less than 5	39.4	42.7	48.0	38.0	24.3	28.0	35.1	26.8	42.7	41.1	36.3	40.2
5 to 25	49.0	48.9	46.8	49.4	52.7	49.1	53.7	45.0	43.6	50.0	52.7	40.8
over 25	11.5	8.5	5.2	12.6	23.0	22.9	11.2	28.2	13.7	8.9	11.0	19.0
Non-Board Certified Distribution (N)	2976	218	842	476	99	205	418	158	88	430	37	5
Mileage:												
less than 5	43.3	49.0	52.5	40.9	31.1	38.2	39.2	31.2	39.3	39.5	44.4	43.0
5 to 25	48.1	44.5	43.0	48.7	52.0	49.1	52.9	49.0	49.8	52.3	49.5	42.0
over 25	8.6	6.6	4.5	10.4	16.9	12.7	7.9	19.8	11.0	8.2	6.1	15.0

Source: 2

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TABLE 21

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN: CENSUS DIVISION BY CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION

CARDIOLOGY SUBSPECIALTY BOARD IN CARDIOVASCULAR DISEASE CERTIFICATION	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	[illegible]t-North [illegible]al	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO
Cardiology Certified Distribution (N)	645	50	157	115	24	55	93	44	31	71	4	1
Mileage:												
less than 5	30.0	30.1	39.3	30.1	16.6	21.7	28.9	16.0	25.2	32.4	28.8	50.0
5 to 25	49.9	57.4	50.5	48.4	54.5	44.6	53.5	38.1	50.0	49.6	67.5	50.0
over 25	20.1	12.5	10.2	21.5	28.9	33.8	17.6	45.9	24.8	18.0	3.8	0.0
Non-Cardiology Certified Distribution (N)	5961	470	1604	976	195	380	861	310	195	901	56	13
Mileage:												
less than 5	42.4	46.9	51.2	40.4	28.7	34.4	37.8	30.6	43.9	41.0	42.2	40.5
5 to 25	48.5	45.9	44.4	49.2	52.1	49.8	53.3	48.0	45.4	51.1	49.5	40.5
over 25	9.1	7.1	4.4	10.5	19.2	15.8	8.9	21.4	10.7	7.9	8.3	18.9

Source: 2

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TABLE 22

PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIANS: CENSUS DIVISION BY AMERICAN COLLEGE OF CARDIOLOGY MEMBERSHIP

AMERICAN COLLEGE OF CARDIOLOGY (A.C.C.) MEMBERSHIP	Group Total	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS APO/FPO	
		New England	Middle Atlantic	South Atlantic	East-South Central	West-South Central	East-North Central	West-North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone	APO and FPO *
A.C.C. Membership Distribution (N)	2164	147	636	298	79	143	277	126	86	350	19	3
Mileage:												
less than 5	38.3	41.1	48.0	36.6	23.8	26.5	35.0	23.3	35.0	37.6	40.6	58.3
5 to 25	49.1	48.5	46.2	48.6	50.9	47.8	53.0	49.0	49.7	52.2	50.1	28.3
over 25	12.6	10.5	5.7	14.9	25.4	25.7	12.0	27.7	15.3	10.2	9.4	13.3
Non-A.C.C. Membership Distribution (N)	4442	373	1125	793	140	292	677	228	140	622	41	11
Mileage:												
less than 5	42.6	47.0	51.3	40.3	29.4	35.9	37.7	31.8	45.2	41.9	41.6	36.5
5 to 25	48.4	46.5	44.3	49.3	53.2	49.8	53.5	45.6	43.8	50.4	51.1	44.7
over 25	9.1	6.6	4.4	10.4	17.4	14.4	8.9	22.7	11.0	7.7	7.4	18.7

Source: 2

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TABLE 23

DISTRIBUTION AND PERCENTAGE OF CARDIOLOGISTS WITHIN PRACTICE MODE:
BY SPECIALTY
(PRIMARY AND SECONDARY IN CARDIOLOGY, INTERNAL MEDICINE AND OTHER SPECIALTIES)

PRACTICE MODE	SPECIALTY									
	PRIMARY CARDIOLOGY				SECONDARY CARDIOLOGY				ALL CARDIOLOGY	
	Secondary Internal Medicine		Secondary Other Specialties		Primary Internal Medicine		Primary Other Specialties			
	N	%	N	%	N	%	N	%	N	%
NON-INSTITUTIONAL:										
Solo	956	34.6	303	11.0	1282	46.3	226	8.2	2767	100
Partnership	403	37.1	122	11.2	506	46.4	57	5.2	1088	100
Group	405	40.3	105	10.5	457	45.3	30	3.0	1006	100
Sub Total	1765	36.3	531	10.9	2245	46.1	313	6.4	4861	100
INSTITUTIONAL:										
Hospital	397	51.0	170	21.8	158	20.3	53	6.8	778	100
Medical School	278	46.2	176	29.2	75	12.5	73	12.1	602	100
Sub Total	675	48.9	346	25.1	233	16.9	126	9.1	1380	100
OTHER	391	46.7	140	16.7	237	28.3	69	8.2	837	100
TOTAL	2831	40.0	1017	14.4	2715	38.3	517	7.3	* 7078	100

Source: 2

TABLE 24

PERCENTAGE OF CARDIOLOGISTS BY PRACTICE MODE:
CENSUS DIVISION BY MEDICAL SERVICE COMMUNITY'S POPULATION GROUPINGS*

PRACTICE MODE	Population Division	Group Total** Number	NORTHEAST		SOUTH			NORTH CENTRAL		WEST		POSSESSIONS
			New England	Middle Atlantic	South Atlantic	East South Central	West South Central	East North Central	West North Central	Mountain	Pacific	Puerto Rico, V.I., Canal Zone
CARDIOLOGISTS (N)	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NON-INSTITUTIONAL												
Solo	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Partnership	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Group	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
INSTITUTIONAL												
Hospital	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Medical School	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OTHER	under 150,000 over 150,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	under 150,000 over 150,000	[illegible]	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0	100.0 100.0

*Physician estimate of population within 25 mile radius of his office.
**Excludes 34 APO/FPO.

Source: 2

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TABLE 25

CARDIOLOGISTS BY PRACTICE MODE: PERCENTAGE OF CARDIAC PATIENTS BY MILEAGE DISTANCE FROM PHYSICIAN

PRACTICE MODE	Distribution (N)	DISTANCE		
		less than 5 miles	5 to 25 miles	over 25 miles
NON-INSTITUTIONAL:				
Solo	2651	47.3	47.7	4.9
Partnership	1044	41.5	51.0	7.5
Group	964	38.9	48.3	12.8
Sub Total	4659	44.3	48.5	7.1
INSTITUTIONAL:				
Hospital	646	36.5	50.6	12.9
Medical School	482	28.3	42.8	28.9
Sub Total	1128	33.0	47.3	19.7
OTHER	664	33.0	51.1	15.9
ALL CARDIOLOGISTS	6451	41.1	48.5	10.3

Source: 2

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			%	%	%	%	%	%	%	%	%
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TABLE 33

ALL ACTIVE CARDIOLOGISTS:
PERCENTAGE OF PROFESSIONAL ACTIVITY TIME AND PROPORTION OF TIME TO CARDIOLOGY BY SPECIALTY AND SUBSPECIALTY BOARD CERTIFICATION STATUS

TYPE OF ACTIVITY	PRIMARY				SECONDARY				ALL CARDIOLOGISTS	
	Subspecialty Certified (N=598)		Non-Certified (N=3312)		Subspecialty Certified (N=91)		Non-Certified (N=3165)		(N=7166)	
	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD	% of total	% to CD
Direct Patient Care	55.4	48.5	61.7	48.8	53.0	23.5	75.9	29.1	67.3	39.9
Research with Patient Care	6.4	6.0	6.1	5.6	4.6	2.2	1.8	.9	4.2	3.6
Teaching with Patient Care	16.4	13.9	11.9	9.8	11.0	5.2	6.5	3.0	9.9	7.1
Sub Total - Clinical	78.2	68.4	79.7	64.2	68.6	30.9	84.2	33.0	81.4	50.6
Research without Patient Care	3.6	3.4	4.6	4.1	1.0	.6	2.0	.9	3.3	2.6
Teaching without Patient Care	4.6	3.8	3.8	3.1	3.5	1.6	2.0	.9	3.0	2.2
Sub Total - Non-Clinical	8.2	7.2	8.4	7.2	4.5	2.2	4.0	1.8	6.3	4.8
Administrative	8.1		6.6		21.3		7.1		7.2	
Professional	5.5		5.3		5.6		4.7		5.1	
TOTAL	100.0	75.6	100.0	71.4	100.0	33.1	100.0	34.8	100.0	55.4

Source: 2

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- Tables 34 through 38 present statistics related to performance of selected cardiology activities

Total Professional Time Compared to Total Cardiology Professional Time

The Initial Cardiology Survey questionnaire asked for two estimates of professional time. The first was an estimate of total professional time allocated to the indicated category. The second was an estimate of the proportion of that time which pertained to cardiology. Thus, an individual could report "70 percent time in direct care of patients" and the proportion of that time allocated to cardiology might be 100 percent. The calculation, which is necessary to determine total percent of professional activity time in a category which is cardiology-specific, i.e., column 3 below, was made to permit rapid comparisons and derivation of ratios.

Specialty	(1) Percent of Total Professional Time Commited to		(2) Percent of Activity Time Applied to Cardiology		(3) Percent of Total Time Applied to CD
Primary	60.8	x	80.3	=	48.8
Secondary	75.3	x	38.4	=	28.9

Under the assumption that the Primary Cardiologist is, by definition, a specialist in cardiovascular disease, one could consider the difference between the total activity time (60.8 percent) and the total activity time which is cardiovascular (48.8 percent) as a measure of non-specialist patient care. This difference amounts to 12 percent.

The example given of alternative ways of viewing the data contained in Table 27 pertains to all professional activity tables in this section of the report.

CARDIOLOGY PROFESSIONAL DIARY

As noted previously, the data obtained through the Cardiology Professional Diary study provided the most reliable information regarding the time devoted to types of professional activities as well as the actual activities themselves. It would not have been possible, of course, to arrive at this conclusion concerning quality of data obtained without data both from a questionnaire and from a log-diary for comparisons.

In this section we will present those statistics regarding professional activities obtained through use of the log-diary which are believed most pertinent to cardiologist's role definition.

TABLE 34

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY SPECIALTY

TYPE OF ACTIVITY	SPECIALTY		ALL CARDIOLOGISTS (N=7045)
	Primary Cardiologist (N=3876)	Secondary Cardiologist (N=3169)	
Office Consultant for Cardiac Patients	84.1	87.7	85.7
Office ECG Reader	71.5	81.7	76.1
Hospital Consultant for Cardiac Patients	92.9	80.6	87.4
Hospital ECG Reader	77.0	60.9	69.8
Hospital CCU Committee	64.8	53.2	59.6
Cardiac Diagnostic Roentgenography	37.3	14.8	27.2
Cardiac Catheterization	40.9	7.9	26.0

Source: 2

TABLE 35

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY PHYSICIAN AGE GROUPINGS AND PRIMARY OR SECONDARY SPECIALTY CLASSIFICATION

TYPE OF ACTIVITIES	LESS THAN 40 YEARS (N= 1964)		40 TO 59 YEARS (N= 3782)		60 YEARS AND OVER (N= 1208)		ALL AGES (N= 6954)	
	PRIMARY (N= 1310)	SECONDARY (N= 654)	PRIMARY (N= 1937)	SECONDARY (N= 1845)	PRIMARY (N= 586)	SECONDARY (N= 622)	PRIMARY (N= 3833)	SECONDARY (N= 3121)
Office Consultant for Cardiac Patients	73.0	82.0	89.3	90.9	91.8	84.6	84.1	87.8
Office ECG Reader	61.0	76.3	77.2	83.6	76.3	82.2	71.5	81.8
Hospital Consultant for Cardiac Patients	94.1	84.7	95.0	84.4	83.3	65.9	92.9	80.8
Hospital ECG Reader	80.3	68.8	78.7	63.1	64.7	46.8	77.1	61.1
Hospital CCU Committee	62.6	59.0	71.6	56.4	47.1	38.4	64.8	53.4
Cardiac Diagnostic Roentgenography	53.1	22.0	33.6	13.3	15.7	12.1	37.3	14.9
Cardiac Catheterization	70.0	20.0	35.1	7.0	4.9	1.8	42.4	9.3

Source: 2

TABLE 36

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES
BY PHYSICIAN AGE GROUPINGS AND SPECIALTY BOARD CERTIFICATION STATUS

	LESS THAN 40 YEARS (N= [illegible])		40 TO 59 YEARS (N= [illegible])		60 YEARS AND OVER (N= [illegible])		ALL AGES (N= [illegible])	
TYPE OF ACTIVITIES	BOARD CERTIFIED (N= [illegible])	NON-CERTIFIED (N= [illegible])	BOARD CERTIFIED (N= [illegible])	NON-CERTIFIED (N= [illegible])	BOARD CERTIFIED (N= [illegible])	NON-CERTIFIED (N= [illegible])	BOARD CERTIFIED ([illegible])	NON-CERTIFIED ([illegible])
Office Consultant on Cardiac Patients	86.1	88.8	91.4	88.8	91.8	85.9	[illegible]	85.3
Office ECG Reader	72.8	61.3	76.8	81.1	77.6	81.2	77.8	74.3
Hospital Consultant for Cardiac Patients	94.8	88.8	92.8	86.8	[illegible]	65.4	91.6	80.4
Hospital ECG Reader	86.7	76.5	75.6	64.6	59.8	50.5	72.8	65.2
Hospital CCU Committee	65.8	55.4	69.1	50.8	68.1	26.5	65.6	50.2
Cardiac Diagnostic Roentgenography	45.5	41.1	25.6	21.8	14.6	13.2	27.1	26.8
Cardiac Catheterization	54.3	33.0	26.1	18.3	8.1	5.6	27.3	27.8

Source: 2

TABLE 37

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES BY PHYSICIAN AGE GROUPINGS AND SUBSPECIALTY BOARD OF CARDIOVASCULAR DISEASE CERTIFICATION STATUS

TYPE OF ACTIVITIES	LESS THAN 40 YEARS [illegible]		40 TO 49 YEARS [illegible]		50 YEARS AND OVER [illegible]		ALL AGES [illegible]	
	SUBSPECIALTY CERTIFIED [illegible]	NON-CERTIFIED [illegible]	SUBSPECIALTY CERTIFIED [illegible]	NON-CERTIFIED [illegible]	SUBSPECIALTY CERTIFIED [illegible]	NON-CERTIFIED [illegible]	SUBSPECIALTY CERTIFIED [illegible]	NON-CERTIFIED [illegible]
Office Consultant for Cardiac Patients	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Office ECG Reader	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hospital Consultant for Cardiac Patients	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hospital ECG Reader	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hospital ECG Consultant	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiac Diagnostic [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiac Catheterization	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: 2

TABLE 38

PERCENTAGE OF PHYSICIANS PERFORMING SELECTED TYPES OF CARDIOLOGY ACTIVITIES: BY MEDICAL SERVICE COMMUNITY POPULATION GROUPINGS*

TYPE OF ACTIVITY	MEDICAL SERVICE COMMUNITY		ALL CARDIOLOGISTS (N=6488)
	Population under 150,000 (N=1193)	Population over 150,000 (N=5294)	
Office Consultant for Cardiac Patients	99.6	95.8	96.5
Office ECG Reader	83.0	76.7	76.8
Hospital Consultant for Cardiac Patients	88.6	87.2	87.6
Hospital ECG Reader	78.6	67.1	70.0
Hospital CCU Committee	71.0	56.5	60.0
Cardiac Diagnostic Roentgenography	22.6	28.5	27.2
Cardiac Catheterization	15.0	29.0	25.8

*Physician estimate of population within a twenty-five mile radius of his office.

Source: 2

This study was the principal method used to determine what the cardiologists do within the context of a professional day. The characteristics of the log diary, design considerations, sampling and analysis issues were discussed in Chapter Two, pages [illegible] through [illegible].

It will be remembered that there were [illegible] cardiologists who kept the log diary during an assigned five day time period. The recording times were selected to estimate occurrence of all days of the week in the week period. Having sampled days as well as individuals, the resultant statistics reflect a typical day within a typical week.

The data are presented by the log diary sections:

- Activity Overview
- Patient Care
- Laboratory & Diagnostic Testing
- Research
- Teaching

Activity Overview Data

Data are presented in this section by cardiologists days and by units applicable to particular activity reported in these items. It is important, therefore, to recognize the base for the table in interpreting the data which it contains. For example, there were [illegible] cardiologist days, about [illegible] patient encounters and approximately [illegible] patients involved. Therefore, activity data has been weighted to provide a distribution equivalent to that which would have been obtained if the cardiologists had been surveyed in proportion to their actual numbers within a cardiologist type.

Activity Overview Content Analytic Categories

The content analysis plan employed seven primary and six secondary classification variables. The variable, "direct patient care", was expanded to three; unspecified "personal time" was expanded to two; "travel" was expanded to three. In all, [illegible] recording classification possibilities were established, of which only [illegible] categories were included. The content analysis plan is summarized below.

[illegible]

[illegible]

Primary Classification Category

Direct Patient Care
Teaching
Research
Professional
Administration
Personal
  1. Less than 1/2 day
  2. 1/2 day or more
Travel
  1. Local Professional
  2. Long Distance Professional
  3. Personal

Secondary Classification Category

General Consultation
Direct Patient Care
  1. Hospital Patients
  2. Office Patients
  3. Emergency Patients
  4. Laboratory and Diagnostic Testing
  5. Other
Teaching
Research
Professional
Administration

[illegible]

[illegible]

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TABLE 42

CARDIOLOGISTS IN INSTITUTIONAL PRACTICE: DISTRIBUTION OF AVERAGE TIME (MINUTES) IN PROFESSIONAL ACTIVITIES PER DAY BY SPECIALTY AND PRACTICE BY COMMUNITY SIZE**

Type of Activity	Primary			Secondary			All		
	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined	over 150,000	under 150,000	Combined
Doctor Days (N_w)	283	41*	324	87	21*	108	1426	480	1906
Direct Patient Care	184.0	193.4	185.2	201.1	217.3*	204.2	320.0	373.8	333.6
Research with Patients	10.8	6.7*	10.3	10.1	4.5*	9.0	3.6	1.5	3.1
Research without Patients	81.1	71.7*	79.9	32.7	5.8*	27.5	22.0	9.9	19.0
Teaching with Patients	59.9	107.1*	65.8	40.8	53.9*	43.4	36.3	28.8	34.4
Teaching without Patients	32.3	40.6*	33.4	51.2	35.5*	48.1	15.2	14.5	15.0
Administration	58.4	40.1*	56.1	110.5	109.5*	110.3	51.3	46.0	49.9
Professional	71.3	53.7*	69.1	65.2	54.5*	63.1	56.2	44.0	53.1
Travel	46.0	54.9*	47.1	54.9	50.4*	54.0	47.2	36.4	44.5
Total Average Minutes per Day	543.8	568.2*	546.9	566.5	531.4*	559.6	551.8	554.9	552.6
Average Hours per Day	9.1	9.5*	9.1	9.4	8.9*	9.3	9.2	9.3	9.2

* The frequencies are too small to use these data with the confidence established for the total study.

** Community size defined by the physicians as approximate number of people within a radius of 25 miles of their practice location.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Scurce: 3

TABLE 43

SINGLE AND MULTIPLE PATIENT ENCOUNTERS
DISTRIBUTION AND PERCENT BY SETTING AND BY SPECIALTY AND PRACTICE

Setting	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Office					
Single Encounters (Patients)	4255 (92.3)	7197 (88.3)	324 (85.3)	202 (92.4)	11978 (89.6)
Repeat Encounters	355 (7.7)	958 (11.7)	56 (14.7)	16 (7.6)	1385 (10.4)
Office Encounters Total	4610 (100.0)	8155 (100.0)	380 (100.0)	218 (100.0)	13363 (100.0)
Hospital					
Single Encounters (Patients)	2116 (51.0)	2029 (49.6)	669 (66.2)	265 (65.6)	5079 (52.6)
Repeat Encounters	2029 (49.0)	2062 (50.4)	342 (33.8)	139 (34.4)	4572 (47.4)
Hospital Encounters Total	4145 (100.0)	4091 (100.0)	1011 (100.0)	404 (100.0)	9651 (100.0)
Combined					
Single Encounters (Patients)	6371 (72.8)	9226 (75.3)	993 (71.4)	467 (75.0)	17057 (74.1)
Repeat Encounters	2384 (27.2)	3020 (24.7)	398 (28.6)	155 (25.0)	5957 (25.9)
Combined Encounters Total	8755 (100.0)	12246 (100.0)	1391 (100.0)	622 (100.0)	23014 (100.0)

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 44

CARDIOLOGIST'S CONTACTS WITH PATIENTS: WEIGHTED AND UNWEIGHTED PATIENT ENCOUNTERS BY TYPE OF SETTING BY SPECIALTY AND PRACTICE

Type of Setting	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	N	%	N	%	N	%	N	%	N	%
Office										
Unweighted	3748	36.3	5334	51.7	655	6.3	590	5.7	10327	100.0
Weighted	4610	34.5	8155	61.1	380	2.8	218	1.6	13363	100.0
Hospital										
Unweighted	3370	38.0	2674	30.1	1743	19.6	1092	12.3	8879	100.0
Weighted	4145	42.9	4091	42.4	1011	10.5	404	4.2	9651	100.0
Combined										
Unweighted	7118	37.0	8008	41.7	2398	12.5	1682	8.8	19206	100.0
Weighted	8755	38.1	12251	53.2	1391	6.0	622	2.7	23014	100.0

Source: 3

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The effect of weighted and non-weighted frequencies in comparisons between groups is shown in the table above.

In no instance is log-diary data presented that has not been weighted where failure to do so would permit incorrect conclusions if the statistics presented were extended to all cardiologists.

Patient Care Statistics

Statistical tables have been prepared with each of the primary analysis variables and patient descriptors as a major analysis dimension.

Age of patients for both cardiac and non-cardiac patients is presented in Tables 45 and 46.

Sex of patients for both cardiac and non-cardiac patients is presented in Tables 47 and 48.

Patient Ethnicity. White (W), Black (B) and Other (O) were used in the patient descriptors to denote ethnic and/or racial differences. The categories did not produce the differentiation desired - possibly because of the ambiguity related to what constitutes "White" and what constitutes "Other". Keeping in mind the fact that "Other" is badly under-reported, Table 49 summarizes patient encounters by this ethnic classification.

Distant to Care. It was expected that patients would travel farther to see a Primary Cardiologist than to see a Secondary Cardiologist, and that, in turn, proportionately more time would be given to those coming greater distances than to those in close proximity to the cardiologist. Tables 50 and 51 present distance related statistics which support this assumption.

Patient Sources and Time. Tables 52, 53, and 54 examine cardiologist's patients by where seen and by whether they are referral patients or patients within the cardiologist's practice. The time given to these classes of patients in either the office or hospital setting is presented in Tables 55 and 56. The relatively larger number of patients seen by the specialist as referral patients is not unexpected. One should not conclude that those noted as "own practice" are not primarily cardiac; this latter allocation is discussed in a later section.

Cardiologists' Patients Clinical Conditions

The clinical conditions encountered and reported by the cardiologists provide

TABLE 45

PRIMARY CARDIAC PATIENT'S AGE: COMBINED OFFICE AND HOSPITAL AGE-GROUPED PATIENTS BY SPECIALTY AND PRACTICE (DISTRIBUTION IN PERCENT)

Age Groups	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Combined N_w	3683	3346	720	200	7949
Percent of Total %	46.4	42.1	9.0	2.5	100.0
4 years and under	0.3	0.3	0.6	0.4	0.3
5 through 14 years	0.7	0.5	1.1	1.8	0.7
15 through 24 years	2.3	2.7	4.7	3.7	2.7
25 through 34 years	4.1	2.4	6.1	4.6	3.6
35 through 44 years	8.1	8.4	14.3	12.2	8.9
45 through 54 years	18.2	14.7	23.3	19.3	17.2
55 through 64 years	25.0	21.8	21.9	23.1	23.3
65 through 74 years	24.8	29.2	19.3	20.7	26.1
75 through 84 years	13.8	16.1	7.2	12.2	14.1
85 years and over	2.7	3.9	1.5	2.0	3.1
Total	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 46

PRIMARY NON-CARDIAC PATIENT'S AGE: COMBINED OFFICE AND HOSPITAL AGE-GROUPED PATIENTS BY SPECIALTY AND PRACTICE (DISTRIBUTION IN PERCENT)

Age Groups		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Combined	N_w	2595	5716	263	264	8838
	Percent of Total %	29.4	64.6	3.0	3.0	100.0
4 years and under		0.8	0.9	0.4	1.8	0.9
5 through 14 years		2.1	2.7	0.4	3.5	2.5
15 through 24 years		7.7	12.4	8.6	10.1	11.1
25 through 34 years		8.5	10.3	11.5	11.1	9.7
35 through 44 years		11.7	12.1	11.0	12.3	12.0
45 through 54 years		17.7	16.7	20.4	18.3	17.1
55 through 64 years		19.2	16.6	19.8	15.6	17.5
65 through 74 years		19.3	17.6	18.7	11.1	18.0
75 through 84 years		10.9	9.0	7.0	4.8	9.4
85 years and over		1.1	1.7	2.2	1.4	1.6
	Total	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 47

CARDIOLOGISTS' CARDIAC PATIENTS BY SEX: PATIENTS' SETTING BY TYPE BY SPECIALTY AND PRACTICE

Patient and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_w	2439	2526	244	78	5287
Male	%	50.1	46.9	56.3	53.6	48.8
Female	%	49.9	53.1	43.7	46.4	51.2
Total	%	100.0	100.0	100.0	100.0	100.0
Hospital	N_w	1256	843	476	123	2698
Male	%	52.3	50.6	58.7	57.7	53.2
Female	%	47.7	49.4	41.3	42.3	46.8
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_w	3695	3369	720	201	7985
Male	%	50.8	47.9	57.9	56.1	50.3
Female	%	49.2	52.1	42.1	43.9	49.7
Total	%	100.0	100.0	100.0	100.0	100.0

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE [illegible]

[illegible]

[illegible]		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Offices	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Male	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Female	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	%	100.0	100.0	100.0	100.0	100.0
Hospitals	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Male	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Female	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	%	100.0	100.0	100.0	100.0	100.0
Combined	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Male	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Female	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	%	100.0	100.0	100.0	100.0	100.0

N_w [illegible]

Source: [illegible]

TABLE [illegible]

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[illegible]

Ethnicity and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
White	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Black	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	%	[illegible]	[illegible]	–	[illegible]	[illegible]
Total	%	[illegible]	[illegible]	[illegible]	[illegible]	100.0
Hospital	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
White	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Black	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	%	[illegible]	[illegible]	[illegible]	–	[illegible]
Total	%	[illegible]	[illegible]	[illegible]	[illegible]	100.0
Combined	N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
White	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Black	%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	%	[illegible]	[illegible]	[illegible]	–	[illegible]
Total	%	[illegible]	[illegible]	[illegible]	[illegible]	100.0

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FIGURE 55

AVERAGE ENCOUNTER TIME WITH CARDIAC PATIENTS:
ENCOUNTER SETTING BY PATIENT SOURCE BY SPECIALTY AND PRACTICE
(AVERAGE TIME IN MINUTES)

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	2471	2838	273	80	5662
Source:						
Referral	(Min.)	33.5	22.9	40.7	32.9	30.6
Own Practice	(Min.)	23.7	19.1	26.5	23.7	21.3
Hospital	N_W	2392	1654	661	192	4899
Source:						
Referral	(Min.)	19.2	15.5	28.9	18.6	20.1
Own Practice	(Min.)	16.9	15.4	22.2	20.8	16.7
Combined	N_W	4863	4492	934	272	10561
Source:						
Referral	(Min.)	23.9	18.3	31.2	20.2	23.4
Own Practice	(Min.)	21.1	18.0	24.2	22.3	19.7

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 56

AVERAGE ENCOUNTER TIME WITH NON-CARDIAC PATIENTS: ENCOUNTER SETTING BY PATIENT SOURCE BY SPECIALTY AND PRACTICE (AVERAGE TIME IN MINUTES)

Patient Source and Type of Setting		Non-Institutional		Institutional		All
		Primary	Secondary	Primary	Secondary	
Office	N_W	1838	5036	88	130	7092
Source:						
Referral	(Min.)	26.0	23.4	44.0	25.9	25.0
Own Practice	(Min.)	18.9	18.6	27.6	20.2	18.8
Hospital	N_W	1470	2175	247	196	4088
Source:						
Referral	(Min.)	18.0	15.0	28.0	21.3	18.0
Own Practice	(Min.)	16.0	15.2	15.4	20.3	15.7
Combined	N_W	3308	7211	335	326	11180
Source:						
Referral	(Min.)	20.5	19.3	31.0	22.3	20.8
Own Practice	(Min.)	17.9	17.7	19.9	20.2	17.9

N_W indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

indices of the prevalence of cardiac disease within practices and the possible emphases which should be given in the training of individuals to manage these conditions. If one assumes that the situations cardiologists actually encounter are indicators of what they should be able to manage, then programs can be developed in those areas which (1) represent high occurrence conditions and/or (2) are sufficiently serious in their actual recognized setting to warrant training going beyond the ability to identify the condition. The data which have been analyzed may permit judgments regarding which of the conditions constitute the core which all cardiologists should be capable of handling and which could be handled on a referral basis by others.

Tables 57 and 58 for primary cardiac conditions and Tables 59 and 60 for primary non-cardiac conditions present the percentage distribution by each type of specialist for each of the diagnostic conditions. Tables 57 and 59 give these percentages for all encounter locations. Tables 58 and 60 provide the percentages for patients seen in the office and in the hospital. The first (general) table for cardiac or non-cardiac is the overall choice frequency. The second (allocating patients by location) provides inferential data related to severity of the problem, i.e., those in the hospital are presumably sicker than those who are seen and released from the office. The data contained in these tables may be seen as summary patient profiles according to the disease categories indicated for each of the types of cardiologist and for all cardiologists. Viewed as such they provide interesting insights regarding the primacy of either cardiac or non-cardiac conditions within cardiologists' practices. However, these summaries are overly simplistic since they do not take secondary cardiac or non-cardiac condtions into account - they are limited exclusively to primacy of disease condition.

Seventy-four percent of all primary cardiac patients have one of six cardiac conditions. (Table 57.) These are:

o	Coronary atherosclerosis, without infarction	26.1 percent
o	Hypertension	20.7 percent
o	Acute myocardial infarction	9.4 percent
o	Heart failure: chronic, severe	8.1 percent
o	Rheumatic	5.1 percent
o	Arrhythmia	4.1 percent

Table 58 provides distributions for the cardiologists' patients in the office and in the hospital. Each column totals 100 percent to permit comparisons of occurrence by encounter setting (office or hospital) for a particular disease condition. For example, acute myocardial infarction is reported by all cardiologists 4.9

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TABLE 57

PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS:
CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE

Primary Cardiac Diagnosis	Non-Institutional		Institutional		All Cardiologists
	Primary	Secondary	Primary	Secondary	
Percent of All Cardiac Diagnoses	46.3	42.2	[illegible]	[illegible]	[illegible]
Heart Failure: Acute, Severe	2.6	3.2	[illegible]	[illegible]	[illegible]
Heart Failure: Chronic, Severe	6.8	9.7	[illegible]	[illegible]	[illegible]
Acute Myocardial Infarction	9.5	8.7	[illegible]	[illegible]	[illegible]
Pulmonary Embolism	1.9	1.1	[illegible]	[illegible]	[illegible]
Pericardial Disease	0.6	0.5	[illegible]	[illegible]	[illegible]
Coronary Atherosclerosis, without infarction	28.0	24.1	[illegible]	[illegible]	[illegible]
Hypertension	20.5	23.4	[illegible]	[illegible]	[illegible]
Rheumatic	5.2	3.5	[illegible]	[illegible]	[illegible]
Cardiomyopathy	1.5	0.9	[illegible]	[illegible]	[illegible]
Arrhythmia	5.4	2.8	[illegible]	[illegible]	[illegible]
Infectious	0.1	-	[illegible]	-	[illegible]
Peripheral Vascular Disease	3.3	3.1	[illegible]	[illegible]	[illegible]
Cerebral Vascular Disease	2.6	4.7	[illegible]	[illegible]	[illegible]
Psychosomatic (Cardiac)	1.4	1.9	[illegible]	[illegible]	[illegible]
Post Cardiac Surgery	2.1	0.9	[illegible]	[illegible]	[illegible]
Pacemaker Evaluation	1.0	0.4	[illegible]	[illegible]	[illegible]
Congenital	1.7	0.7	[illegible]	[illegible]	[illegible]
None	3.7	9.0	[illegible]	[illegible]	[illegible]
Other	2.1	1.4	[illegible]	[illegible]	[illegible]
TOTAL	100.0	100.0	100.0	100.0	100.0
N_w	3573	3126	[illegible]	[illegible]	[illegible]

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

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TABLE 58

PATIENTS WITH PRIMARY CARDIAC DIAGNOSES:
CARDIAC DIAGNOSES PERCENTAGE BY SPECIALTY AND PRACTICE
BY TYPE OF SETTING

Primary Cardiac Diagnosis	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital
Percent of All Cardiac Diagnoses by Setting	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0	100.0
Percent of Diagnostic Categories within Settings:										
Heart Failure: Acute, Severe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]
Heart Failure: Chronic, Severe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acute Myocardial Infarction	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pulmonary Embolism	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]
Pericardial Disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Coronary Atherosclerosis, without infarction	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hypertension	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rheumatic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiomyopathy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Arrhythmia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Infectious	[illegible]	[illegible]	-	[illegible]	-	[illegible]	-	-	-	[illegible]
Peripheral Vascular Disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cerebral Vascular Disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Psychosomatic (Cardiac)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Post Cardiac Surgery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]
Pacemaker Evaluation	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Congenital	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
None	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 3

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TABLE 59

PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSES: NON-CARDIAC DIAGNOSIS PERCENTAGE BY SPECIALTY AND PRACTICE

Primary Non-Cardiac Diagnosis	Non-Institutional		Institutional		All Cardiologists
	Primary	Secondary	Primary	Secondary	
Percent of All Non-Cardiac Diagnoses	[illegible]	[illegible]	[illegible]	[illegible]	100.0
Respiratory	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Renal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Neurological	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gastro-intestinal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Musculoskeletal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Psychiatric	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Genito-Urinary	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dermatological	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Obstetrics/ Gynecology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Endocrine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EENT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Checkup, Physical Exam	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Blood and Lymphatic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	100.0	100.0	100.0	100.0	100.0
N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

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TABLE 68

[illegible]

Primary Non-Cardiac Diagnosis	Non-Institutional				Institutional				All Cardiologists	
	Primary		Secondary		Primary		Secondary			
	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital	Office	Hospital
Percent of All Non-Cardiac Diagnoses by Setting	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0	100.0
Percent of Diagnostic Categories within Settings:										
Respiratory	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Renal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Neurological	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gastro-Intestinal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Musculoskeletal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Psychiatric	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Genito-Urinary	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dermatological	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]
Obstetrical/ Gynecologic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Endocrine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EENT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
None	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Checkup, Physical Exam	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Blood and Lymphatic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 3

percent of the time for office patients and 18.[illegible] percent of the time for hospital patients. There are no apparent anomalies in these distributions; conditions of a minor nature are more predominantly seen in the office and those which would require extensive treatment facilities, or been in their advanced stages, are found more commonly in the hospital.

The primary non-cardiac distribution tables follow exactly the same format as that been discussed for cardiac. Table 59 provides frequency of occurrence for conditions by each type of specialty. Table 60 gives the same percent data except that they are distributed between office and hospital.

The primary non-cardiac diagnostic data are presented (1) to complete the description of cardiologists' practice and (2) as contributory conditions to other, secondary cardiac conditions. The relationship of cardiac to non-cardiac is discussed and presented for selected primary conditions in the section which follows.

While the occurrence of non-cardiac primary conditions has a wider distribution range (even conditions with relatively high occurrence rates), five conditions account for 58 percent of all primary non-cardiac patient diagnoses. These are:

- Respiratory 15.8 percent
- Gastro-intestinal 15.7 percent
- Musculoskeletal 13.5 percent
- Check up (physical) 6.8 percent
- Endocrine 6.8 percent

Cardiac Specialty and Non-Specialty Care

The log-diary obtained a cardiologist classification as to whether or not the nature of patient problem conditions cited was primarily cardiac or primarily non-cardiac. This classification permitted analysis by the permutations cited in Tables 61, 62 and 63. There are eight patient condition groupings used in these tables. The eight may be summarized by three categories. It may be noted that for all cardiologists, approximately 87 percent of the patients were primary cardiac patients (Table 61.1). It is assumed that for both the Primary Cardiologists and the Secondary Cardiologists that specialized care is being provided. It is not possible to differentiate between those patients which are referred and those which are not from these particular tables.

The primary non-cardiac with associated cardiac condition describe patients with multiple clinical problems. It is assumed that both specialized and general

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[illegible]

[illegible]	[illegible]		[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	
N_w	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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N_w [illegible]

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TABLE 66

CARDIOLOGISTS' OFFICE AND HOSPITAL PATIENT ENCOUNTERS: AVERAGE TIME (IN MINUTES) WITH PATIENTS BY CARDIAC AND NON-CARDIAC CONDITIONS BY SPECIALTY AND PRACTICE

Time and Diagnostic Conditions	Non-Institutional		Institutional		All
	Primary (minutes)	Secondary (minutes)	Primary (minutes)	Secondary (minutes)	(minutes)
Primary Cardiac					
Cardiac Only	21.4	16.8	30.2	22.4	20.7
Cardiac with Cardiac	22.9	17.8	26.2	19.1	21.2
Cardiac with Non-Cardiac	22.3	17.6	29.6	20.4	20.7
Cardiac with Cardiac and Non-Cardiac	21.9	19.2	23.4	22.5	20.7
Primary Non-Cardiac with Cardiac					
Non-Cardiac with Cardiac	18.1	18.2	26.9	22.0	18.7
Non-Cardiac with Non-Cardiac and Cardiac	18.5	18.0	24.1	21.4	18.4
Primary Non-Cardiac					
Non-Cardiac Only	18.8	17.0	21.4	20.0	17.6
Non-Cardiac with Non-Cardiac	20.6	19.9	19.8	21.0	20.1

Source: 3

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TABLE 67

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS AND PERCENTAGE
DISTRIBUTION FOR ASSOCIATED SECONDARY CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS CARDIAC			SECONDARY ASSOCIATED CARDIAC DIAGNOSIS (Percent of Total for Each Condition)																			
TYPE	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	Heart Failure: Acute, Severe	Heart Failure: Chronic, Severe	Acute Myocardial Infarction	Pulmonary Embolism	Pericardial Disease	Coronary Atherosclerosis, without infarction	Hypertension	Rheumatic	Cardiomyopathy	Arrhythmia	Infectious	Peripheral Vascular Disease	Cerebral Vascular Disease	Psychosomatic (Cardiac)	Post Cardiac Surgery	Pacemaker Evaluation	Congenital	Other	TOTAL
Heart Failure: Acute, Severe	O	68	36.8	-	10.4	1.8	5.9	-	18.0	7.6	1.8	1.8	2.3	-	6.8	4.5	-	-	-	-	2.3	100.0
	H	166	26.7	-	13.7	18.1	2.0	1.0	16.4	4.1	5.0	0.3	8.5	0.3	0.7	0.9	-	0.3	-	0.3	1.7	100.0
Heart Failure: Chronic, Severe	O	372	33.9		-	4.8	0.8	-	31.6	11.1	7.2	2.7	2.8	-	2.1	2.1	0.4	0.5	-	-	-	100.0
	H	275	35.5	0.6	-	5.3	2.2	0.1	24.9	12.0	7.5	1.6	5.3	-	1.5	1.9	-	0.4	1.0	0.2	-	100.0
Acute Myocardial Infarction	O	260	62.0	0.9	4.4	-	1.7	-	9.5	7.3	0.2	-	8.2	-	2.5	0.5	-	1.1	1.1	-	0.6	100.0
	H	489	73.1	3.7	1.4	-	1.3	0.3	2.6	1.6	0.6	-	10.7	0.2	2.7	0.4	-	0.1	0.9	-	0.4	100.0
Pulmonary Embolism	O	45	73.3	-	2.7	-	-	-	14.3	4.0	-	-	5.5	-	-	-	-	-	-	-	-	100.0
	H	83	77.1	-	-	3.3	-	0.7	4.8	6.7	4.4	-	-	-	1.5	1.5	-	-	-	-	-	100.0
Pericardial Disease	O	16	69.5	-	-	-	-	-	18.8	-	11.7	-	-	-	-	-	-	-	-	-	-	100.0
	H	32	58.7	4.8	4.8	7.7	3.8	-	5.6	8.4	-	1.2	-	-	-	-	-	1.2	-	3.8	-	100.0
Coronary Atherosclerosis, without infarction	O	1548	60.0	0.2	2.2	0.6	0.3	-	-	18.2	0.5	0.2	6.1	0.1	3.3	4.4	0.5	1.6	0.7	0.3	0.8	100.0
	H	538	68.8	1.1	2.6	0.8	0.5	-	-	7.1	0.8	0.3	5.4	-	3.5	4.7	0.1	3.3	0.7	-	0.3	100.0
Hypertension	O	1405	78.0	0.2	1.1	0.7	0.3	0.1	6.5	-	0.7	0.5	2.2	-	3.0	5.2	0.7	0.1	-	0.2	0.5	100.0
	H	246	71.4	0.7	1.8	0.5	-	0.2	6.3	-	-	1.1	3.9	-	3.7	9.1	-	-	0.6	-	0.7	100.0
Rheumatic	O	267	63.3	-	7.2	-	-	-	2.7	0.9	-	0.9	10.6	2.1	0.9	0.5	-	10.7	-	0.2	-	100.0
	H	140	52.9	1.9	4.6	0.9	0.9	-	4.4	-	-	0.4	11.5	0.4	0.4	2.4	-	18.0	-	0.4	0.9	100.0
Cardiomyopathy	O	62	73.1	-	5.9	-	-	-	2.5	2.0	-	-	8.5	2.0	2.0	-	-	2.0	2.0	-	-	100.0
	H	52	80.5	-	6.3	0.7	-	2.9	0.7	-	-	-	5.3	-	2.9	-	-	-	-	0.7	-	100.0
Arrhythmia	O	206	76.5	-	2.8	-	-	-	5.0	6.4	0.6	0.6	-	-	0.6	1.9	3.1	0.6	1.9	-	-	100.0
	H	121	70.4	-	3.5	2.0	-	-	5.0	-	3.3	0.5	-	-	-	4.6	1.3	1.5	7.9	-	-	100.0
Infectious	O	1	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	9	68.0	-	-	-	-	-	-	14.3	-	-	17.7	-	-	-	-	-	-	-	-	100.0
Peripheral Vascular Disease	O	157	71.3	-	1.8	0.8	0.8	-	5.5	4.5	-	-	-	-	-	13.7	-	-	-	-	1.6	100.0
	H	89	72.7	-	-	-	-	-	8.6	3.8	-	-	4.5	-	-	8.0	-	-	-	-	2.4	100.0
Cerebral Vascular Disease	O	159	71.3	-	1.9	-	-	-	7.7	12.5	-	-	2.9	-	1.9	-	1.0	0.8	-	-	-	100.0
	H	110	64.6	-	2.8	1.4	-	-	9.8	9.8	1.1	-	3.6	-	4.7	-	-	1.1	1.1	-	-	100.0
Psychosomatic (Cardiac)	O	91	92.5	-	-	-	-	-	2.3	3.4	-	0.4	1.4	-	-	-	-	-	-	-	-	100.0
	H	34	86.3	-	4.5	-	-	-	9.2	-	-	-	-	-	-	-	-	-	-	-	-	100.0
Post Cardiac Surgery	O	62	75.1	1.9	-	1.9	-	-	3.9	-	1.9	-	3.9	-	1.9	-	2.4	-	4.3	2.8	-	100.0
	H	66	67.9	-	2.4	-	0.9	-	9.0	-	9.8	-	1.9	1.9	-	-	-	-	1.9	3.7	0.6	100.0
Pacemaker Evaluation	O	34	61.6	-	7.3	-	-	-	20.0	3.7	-	3.7	-	-	-	3.7	-	-	-	-	-	100.0
	H	34	79.7	-	1.7	-	-	-	18.6	-	-	-	-	-	-	-	-	-	-	-	-	100.0
Congenital	O	71	79.1	-	-	-	-	-	5.1	-	-	-	1.7	1.7	-	-	1.7	10.7	-	-	-	100.0
	H	49	77.8	-	-	-	2.5	-	2.4	-	-	-	-	1.2	2.5	-	-	13.6	-	-	-	100.0
Other	O	102	85.4	1.2	-	-	-	-	8.6	1.2	-	1.2	1.2	-	-	-	-	1.2	-	-	-	100.0
	H	59	89.5	-	-	-	2.1	-	2.1	-	-	-	-	-	2.1	-	2.1	-	2.1	-	-	100.0

*"Type of Setting": O=office; H=hospital.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

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TABLE 68

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY CARDIAC DIAGNOSIS AND PERCENTAGE
DISTRIBUTION FOR ASSOCIATED SECONDARY NON-CARDIAC DIAGNOSES

PRIMARY DIAGNOSIS CARDIAC			SECONDARY ASSOCIATED NON-CARDIAC DIAGNOSIS (Percent of Total for Each Condition)															
TYPE	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	Respiratory	Renal	Neurological	Gastro-Intestinal	Musculoskeletal	Psychiatric	Genito-Urinary	Dermatological	Obstetrics/Gynecology	Endocrine	EENT	Checkup, Physical Exam	Other	Hemic and Lymphatic	TOTAL
Heart Failure: Acute, Severe	O	68	52.9	21.6	-	4.5	4.1	2.3	4.5	-	-	-	6.8	-	-	2.3	-	100.0
	H	166	60.6	13.3	2.6	2.6	3.5	2.7	2.2	2.2	0.3	1.5	5.8	0.9	-	1.8	-	100.0
Heart Failure: Chronic, Severe	O	372	53.7	11.4	1.4	3.1	5.4	5.2	1.0	2.6	-	0.4	11.7	1.2	1.2	0.6	1.1	100.0
	H	275	53.2	9.6	5.0	1.9	6.9	3.0	2.2	3.1	-	0.4	9.7	-	1.0	1.2	2.8	100.0
Acute Myocardial Infarction	O	260	74.6	2.3	1.2	3.8	2.8	3.0	0.9	-	0.6	-	6.8	0.5	1.2	1.1	1.4	100.0
	H	489	74.8	5.3	0.7	2.0	5.6	1.8	0.9	1.7	-	0.1	5.2	0.2	0.1	1.1	0.5	100.0
Pulmonary Embolism	O	45	67.4	10.9	-	1.3	5.5	7.4	3.4	-	-	1.3	-	-	-	-	2.7	100.0
	H	83	49.7	25.4	1.8	1.8	1.4	8.5	[illegible]	1.5	-	-	-	1.1	-	6.3	1.8	100.0
Pericardial Disease	O	16	75.3	9.4	-	-	-	-	9.4	-	-	-	2.3	-	-	-	3.6	100.0
	H	32	73.5	-	-	4.8	9.5	3.8	-	-	3.6	-	-	-	-	4.8	-	100.0
Coronary Atherosclerosis, without Infarction	O	1548	62.9	4.0	0.7	1.9	6.7	6.9	3.0	1.2	0.3	0.4	8.3	0.7	1.8	0.9	0.3	100.0
	H	538	63.7	6.2	1.3	2.9	6.8	4.7	3.1	3.0	0.2	0.5	3.9	0.3	1.0	1.4	1.0	100.0
Hypertension	O	1405	61.1	3.2	1.9	2.1	4.1	6.6	3.3	2.4	0.5	0.9	9.7	1.4	1.1	0.9	0.8	100.0
	H	246	52.7	3.3	1.4	2.6	7.3	2.7	3.4	6.1	0.9	2.5	16.1	0.8	-	-	0.2	100.0
Rheumatic	O	267	77.6	2.0	0.6	1.6	3.2	2.7	3.0	-	-	1.6	4.7	-	2.1	0.4	0.5	100.0
	H	140	78.1	3.6	0.4	8.0	2.4	1.9	0.9	-	1.1	0.4	2.8	0.4	-	-	-	100.0
Cardiomyopathy	O	62	84.1	4.0	-	-	2.0	2.0	2.0	-	-	-	-	-	2.5	2.5	0.9	100.0
	H	52	85.5	-	1.1	4.1	-	8.2	1.1	-	-	-	-	-	-	-	-	100.0
Arrhythmia	O	206	68.8	3.3	0.7	1.6	4.9	1.5	4.7	0.7	0.7	1.3	9.4	0.6	-	0.6	1.2	100.0
	H	121	74.5	5.4	-	2.5	4.1	4.8	4.8	1.0	-	-	2.3	-	0.3	0.3	-	100.0
Infectious	O	1	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	9	72.3	13.4	-	-	-	-	-	-	-	-	14.3	-	-	-	-	100.0
Peripheral Vascular Disease	O	157	59.1	6.3	-	1.6	4.3	9.8	2.0	1.0	1.6	0.8	5.1	2.5	3.3	0.8	1.8	100.0
	H	89	55.7	4.9	-	0.7	7.3	11.1	2.8	-	-	-	12.3	1.7	-	1.8	1.7	100.0
Cerebral Vascular Disease	O	159	67.0	3.2	1.0	5.0	2.9	5.6	2.2	2.9	-	-	8.6	0.8	-	0.8	-	100.0
	H	110	46.9	7.0	2.8	17.2	4.2	7.0	0.5	5.3	1.1	-	3.7	-	1.4	2.9	-	100.0
Psychosomatic (Cardiac)	O	91	56.4	1.4	-	1.4	3.4	18.9	8.1	1.7	-	-	1.3	-	7.4	-	-	100.0
	H	34	54.4	8.1	4.5	-	-	13.4	12.6	-	-	-	3.4	-	3.6	-	-	100.0
Post Cardiac Surgery	O	62	80.4	-	2.4	3.9	-	0.9	0.9	1.9	-	-	2.4	-	-	2.4	4.8	100.0
	H	66	79.2	-	-	4.2	0.6	3.6	4.6	0.9	-	-	6.9	-	-	-	-	100.0
Pacemaker Evaluation	O	34	91.8	8.2	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	H	34	81.3	1.7	1.7	3.6	-	7.2	-	-	-	-	4.5	-	-	-	-	100.0
Congenital	O	71	85.2	5.1	1.7	-	2.1	1.7	-	2.1	-	-	-	-	-	2.1	-	100.0
	H	49	82.6	3.1	-	-	2.5	-	-	-	-	2.4	0.8	-	-	6.1	2.5	100.0
Other	O	102	73.7	1.5	1.2	1.2	4.6	2.4	3.0	0.4	1.5	-	1.2	1.2	4.5	3.6	-	100.0
	H	59	74.8	4.1	-	-	2.0	6.7	1.0	4.0	-	-	4.1	-	0.6	2.7	-	100.0

*"Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

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TABLE 69

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS AND PERCENTAGE DISTRIBUTION FOR ASSOCIATED SECONDARY CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS NON-CARDIAC			SECONDARY ASSOCIATED CARDIAC DIAGNOSIS (Percent of Total for Each Condition)																			
TYPE	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	Heart Failure: Acute, Severe	Heart Failure: Chronic, Severe	Acute Myocardial Infarction	Pulmonary Embolism	Pericardial Disease	Coronary Atherosclerosis, without Infarction	Hypertension	Rheumatic	Cardiomyopathy	Arrhythmia	Infectious	Peripheral Vascular Disease	Cerebral Vascular Disease	Psychosomatic (Cardiac)	Post Cardiac Surgery	Pacemaker Evaluation	Congenital	Other	TOTAL
Respiratory	O	883	66.6	0.7	2.9	0.7	1.5	0.3	11.6	8.4	1.2	0.2	1.6	0.2	1.8	0.5	0.5	0.2	-	0.3	0.8	100.0
	H	348	44.9	2.0	9.9	1.1	5.0	0.6	15.3	8.0	2.0	0.9	5.7	-	1.9	1.4	-	-	-	-	1.3	100.0
Renal	O	101	40.9	1.2	3.0	1.2	-	-	8.1	31.1	-	3.0	4.5	-	0.4	2.4	-	-	2.1	0.6	1.5	100.0
	H	93	39.2	1.9	6.3	1.3	1.6	2.0	17.4	20.4	2.6	-	6.9	-	0.4	-	-	-	-	-	-	100.0
Neurological	O	277	57.1	0.4	0.9	0.9	0.1	0.6	11.1	13.0	1.2	0.4	3.6	-	2.9	6.3	0.4	-	-	0.9	0.2	100.0
	H	205	39.0	2.6	0.6	2.3	2.3	0.6	15.5	15.7	0.9	1.3	6.4	0.2	0.6	8.7	0.3	-	1.3	0.8	0.9	100.0
Gastro-Intestinal	O	758	68.6	0.7	1.5	0.8	0.4	-	9.2	11.1	0.9	0.2	1.9	0.1	0.9	1.4	1.1	0.3	-	0.4	0.5	100.0
	H	457	55.8	1.6	1.9	1.7	0.8	0.1	18.8	7.2	1.3	0.1	5.1	-	0.9	0.6	2.4	0.3	-	0.3	1.1	100.0
Musculoskeletal	O	871	65.6	0.1	0.7	0.3	0.2	0.2	10.0	10.7	1.2	0.5	3.7	-	2.2	2.3	1.8	0.2	-	-	0.3	100.0
	H	222	47.0	2.0	1.8	1.5	1.5	1.4	18.5	14.6	2.2	1.0	4.8	0.7	0.7	-	0.3	0.7	0.6	-	1.0	100.0
Psychiatric	O	575	68.3	0.8	-	0.1	0.1	0.3	3.5	14.8	0.4	-	3.8	-	1.0	1.3	4.1	0.3	-	-	1.2	100.0
	H	127	56.1	-	1.0	1.8	1.2	-	7.2	17.1	0.5	2.9	2.1	-	-	-	2.2	0.9	-	1.5	5.5	100.0
Genito-Urinary	O	269	68.7	-	0.6	-	0.6	-	14.4	12.4	1.1	-	0.6	-	1.0	0.6	-	-	-	-	-	100.0
	H	118	38.1	-	3.1	2.3	2.6	0.5	19.7	20.2	0.5	1.3	5.7	-	2.1	1.3	2.1	-	-	-	0.5	100.0
Dermatological	O	247	87.6	-	-	-	-	0.1	2.3	7.6	-	-	1.2	-	-	-	0.6	-	-	0.5	0.1	100.0
	H	29	67.7	-	-	-	-	1.3	11.8	5.5	-	-	4.2	-	4.2	5.3	-	-	-	-	-	100.0
Obstetrics/ Gynecology	O	221	75.0	-	0.7	1.4	-	-	2.8	12.9	1.9	0.7	1.4	-	1.9	-	0.7	0.6	-	-	-	100.0
	H	56	52.6	-	1.0	-	0.7	-	11.0	10.1	2.7	-	7.2	-	-	-	-	-	-	4.0	3.9	100.0
Endocrine	O	599	51.6	0.8	0.8	0.3	-	0.2	13.1	21.6	0.5	1.5	3.7	-	2.9	1.2	1.1	0.2	-	0.2	0.3	100.0
	H	180	47.4	0.2	4.7	1.5	1.5	-	11.5	17.3	-	1.7	5.1	0.2	4.4	2.5	-	-	-	0.2	1.8	100.0
EENT	O	217	85.6	-	-	0.3	-	-	2.4	8.9	1.4	-	0.7	-	-	0.7	-	-	-	-	-	100.0
	H	67	82.2	-	0.9	-	-	-	4.1	6.9	0.9	-	2.7	-	-	-	-	-	-	-	2.3	100.0
Checkup, Physical Exam	O	772	87.0	-	1.2	0.4	0.2	-	3.3	4.1	0.4	-	0.7	-	0.3	0.4	0.6	0.2	-	0.5	-	100.0
	H	67	77.0	-	-	0.9	-	-	6.5	7.4	0.9	-	1.8	-	-	-	2.3	0.9	-	-	2.3	100.0
Other	O	308	82.7	0.4	0.6	-	0.5	0.5	3.4	6.4	-	0.5	1.1	-	0.5	-	0.2	-	0.5	0.5	1.9	100.0
	H	170	68.0	2.4	1.8	0.9	-	0.6	8.6	4.1	1.6	1.2	3.3	-	1.5	1.0	-	0.7	-	-	3.5	100.0
Hemic and Lymphatic	O	97	70.0	-	3.2	-	-	-	8.5	6.6	-	1.6	2.5	-	-	6.3	1.3	-	-	-	-	100.0
	H	51	61.1	-	8.3	1.1	-	1.1	10.7	7.6	1.1	-	0.7	-	6.3	-	-	-	-	-	-	100.0

*Type of Setting": O=office; H=hospital.
N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.
Source: 3

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TABLE 70

ALL CARDIOLOGISTS:
PATIENTS WITH PRIMARY NON-CARDIAC DIAGNOSIS AND PERCENTAGE
DISTRIBUTION FOR ASSOCIATED SECONDARY NON-CARDIAC DIAGNOSIS

PRIMARY DIAGNOSIS NON-CARDIAC			SECONDARY ASSOCIATED NON-CARDIAC DIAGNOSIS (Percent of Total for Each Condition)															
TYPE	Type of Setting*	Number (N_w) of Cases	No Secondary Condition	Respiratory	Renal	Neurological	Gastro-Intestinal	Musculoskeletal	Psychiatric	Genito-Urinary	Dermatological	Obstetrics/Gynecology	Endocrine	EENT	Checkup, Physical Exam	Other	Hemic and Lymphatic	TOTAL
Respiratory	O	883	79.1	–	1.2	0.8	4.0	4.5	2.7	1.1	0.3	0.5	3.4	1.0	1.0	0.2	0.2	100.0
	H	348	68.0	–	3.7	4.9	8.3	4.0	1.2	2.0	0.2	–	1.5	1.4	0.4	3.6	–	100.0
Renal	O	101	71.5	–	–	3.9	6.4	2.7	1.5	–	1.2	1.5	5.5	1.5	1.2	1.9	1.2	100.0
	H	93	60.7	1.6	–	5.5	5.0	6.6	–	9.2	–	–	5.2	1.6	1.6	3.0	–	100.0
Neurological	O	277	66.2	1.1	–	–	6.2	12.3	3.0	1.7	2.0	0.6	2.0	0.6	1.1	0.6	0.2	100.0
	H	205	77.5	4.1	1.0	–	4.3	3.5	1.5	1.9	0.5	–	2.4	0.9	–	0.4	1.2	100.0
Gastro-Intestinal	O	758	78.6	0.8	0.2	0.3	–	5.0	5.3	2.7	0.5	0.8	2.7	1.0	1.6	0.3	0.2	100.0
	H	457	81.7	1.8	1.3	1.0	–	4.7	2.0	1.0	–	0.4	3.7	0.3	0.3	0.8	0.2	100.0
Musculoskeletal	O	871	84.0	0.8	0.2	0.4	1.9	–	4.3	0.5	0.8	0.4	3.6	0.5	1.3	0.3	1.0	100.0
	H	222	75.8	2.0	1.4	2.1	1.4	–	2.5	3.4	0.7	–	5.2	0.3	0.7	3.0	0.7	100.0
Psychiatric	O	575	80.8	1.1	0.2	0.5	1.1	2.1	–	0.9	1.1	2.0	5.0	0.5	3.3	0.3	0.3	100.0
	H	127	76.7	2.9	–	1.2	3.6	4.3	–	1.0	1.0	0.3	6.6	–	–	2.4	–	100.0
Genito-Urinary	O	269	87.8	–	0.6	–	1.1	2.6	0.6	–	0.6	1.3	2.7	–	0.6	1.1	1.0	100.0
	H	118	78.9	–	1.0	3.6	1.6	1.0	2.3	–	–	1.0	9.0	–	0.3	1.3	–	100.0
Dermatological	O	247	92.3	–	–	–	0.1	0.6	1.2	–	–	0.6	2.9	0.5	1.2	0.6	–	100.0
	H	29	73.3	–	–	–	3.3	5.3	5.3	4.2	–	–	1.1	–	–	5.3	–	100.0
Obstetrics/Gynecology	O	221	81.0	0.7	–	0.7	0.7	0.7	2.1	–	–	–	5.4	0.7	4.0	0.6	0.6	100.0
	H	56	75.8	5.5	–	–	–	–	2.7	–	–	–	5.0	–	–	11.0	–	100.0
Endocrine	O	599	86.2	1.1	0.9	0.6	1.6	1.4	1.5	1.1	1.4	0.7	–	0.8	1.6	0.6	0.4	100.0
	H	180	74.7	2.9	1.7	2.6	4.0	3.1	1.1	1.4	1.2	0.0	–	2.4	0.8	2.3	0.3	100.0
EENT	O	417	92.3	0.7	–	–	–	0.7	–	0.7	–	–	3.5	–	2.1	–	–	100.0
	H	67	68.4	3.2	–	–	4.1	4.6	–	–	–	–	8.7	–	–	4.1	6.9	100.0
Checkup, Physical Exam	O	772	90.8	1.1	–	0.7	0.8	1.5	1.2	0.4	0.6	1.0	1.5	0.2	–	0.2	–	100.0
	H	87	74.8	4.6	–	–	2.3	–	4.6	2.3	–	–	9.1	2.3	–	–	–	100.0
Other	O	308	92.2	–	–	0.5	1.5	–	–	–	–	1.1	3.6	0.1	1.0	–	–	100.0
	H	170	87.5	0.7	–	1.3	0.2	2.4	0.9	0.9	–	0.7	2.0	0.9	–	–	3.6	100.0
Hemic and Lymphatic	O	97	98.4	1.6	–	–	–	–	–	–	–	–	–	–	–	–	–	100.0
	H	51	97.6	–	–	–	–	–	–	–	–	–	–	–	–	2.4	–	100.0

*"Type of Setting": O=office; H=hospital.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

of occurrence of a particular primary and secondary relationship. "All cardiologists" is the level for data presentation. Other permutation are available, such as Primary Non-Institutional, Primary Institutional, etc.

Patient Treatments and Dispositions

Two levels of data are available regarding what the physician does with his patients once the clinical profile has been established. The first at a summary level and was presented immediately adjacent to the columns where the physician recorded the diagnostic characteristics and hence could be completed with very little effort. Table 71 presents these data for cardiac, Table 72 for non-cardiac and Table 73 for all disposition actions.

From the statistics for cardiac patients, Table 71, the following are noted:

- Drugs are prescribed for 76.0 percent of office patients and 66.4 percent of hospital patients. Differences are pronounced between institutional practices and non-institutional practices:
    - both types of Institutional practice use drugs with approximately 55 percent of their patients;
    - in the Non-Institutional settings,
        - primary specialists use drugs about 70 percent of the time;
        - secondary specialists use drugs about 78 percent of the time.
- Routine laboratory tests are ordered by all cardiologists for approximately 33 percent of office patients and 40 percent of hospital patients. Secondary Cardiologists in Non-Institutional practice have comparable rates in the office but much higher in the hospital - 49 percent.
- ECGs are ordered by all cardiologists for about 26 percent of office patients and 28 percent of hospital patients.
- Other non-invasive studies are ordered by all cardiologists in about 3 percent of the office situations and approximately 6 percent of the hospital cases.
- Catheterizations were ordered to a limited extent for office patients (less than 2 percent) and for approximately 5 percent of the hospital patients.

TABLE 75

CARDIOLOGISTS' PATIENTS WITH PRIMARY CARDIAC CONDITIONS: AVERAGE DISPOSITION ACTIONS BY SPECIALTY AND PRACTICE

Patient Disposition	Type of Setting**	Non-Institutional		Institutional		All Cardiologists
		Primary Average Use	Secondary Average Use	Primary Average Use	Secondary Average Use	Average Use
Prescribed	O	73.6	80.6	53.9	42.0	76.7
Drugs	H	64.5	76.4	57.5	52.0	67.4
Ordered Routine	O	30.8	34.4	53.5	26.1	32.6
Lab Tests	H	35.2	49.4	36.7	31.8	39.7
Ordered	O	27.3	23.4	32.3	28.0	25.7
ECG	H	25.8	28.5	31.9	25.8	27.7
Ordered Other	O	3.7	1.5	7.8	1.4	2.8
Non-Invasive Studies	H	4.7	5.8	9.2	9.9	5.1
Ordered Catheterization	O	1.1	0.4	12.4	1.4	1.3
Test	H	2.3	4.1	12.7	5.7	4.9
Evaluation for	O	1.2	0.2	3.3	0.5	0.8
Cardiovascular Surgery	H	1.3	2.7	9.3	4.2	3.3
Evaluation for	O	0.6	0.2	1.7	0.9	0.5
Other Surgery	H	0.6	1.1	2.5	2.1	1.1
N_w*	O	2304	2294	244	77	4876
N_w*	H	1211	832	476	138	2636

*Includes all patients, whether or not diagnosis reported. (Approximately five (5) per cent have no diagnosis.)

**"Type of Setting": O=office; H=hospital.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents. (Source: 3)

TABLE 73

CARDIOLOGISTS' PATIENTS WITH PRIMARY NON-CARDIAC CONDITIONS: AVERAGE DISPOSITION ACTIONS BY SPECIALTY AND PRACTICE

Patient Disposition	Type of Setting**	Non-Institutional		Institutional		All Cardiologists Average Time
		Primary Average Time	Secondary Average Time	Primary Average Time	Secondary Average Time	
Prescribed Drugs	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Ordered Routine Lab Tests	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Ordered ECG	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Ordered Other Non-Invasive Studies	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Ordered Catheterization Test	[illegible] [illegible]	- [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] -	[illegible] [illegible]
Evaluation for Cardiovascular Surgery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	- [illegible]	[illegible] [illegible]
Evaluation for Other Surgery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
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TABLE 77

CARDIOLOGISTS' TEACHING TOPICS
TYPES OF TEACHING PERCENTAGES* BY SPECIALTY AND PRACTICE

Teaching Topics	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
N_w	228	181	308	88	804
%	28.3	22.5	38.3	11.0	100.0
Clinical Applications					
Rounds and Case Reviews	51.5	41.1	43.9	46.7	45.7
Testing and Dx Techniques	20.5	11.0	30.9	17.7	22.0
Pacemaker, Artificial Valve	1.6	1.7	0.7	-	1.1
Subtotal	73.6	53.8	75.5	64.4	68.8
Formal Lectures					
Non-Cardiovascular Teaching	1.6	11.4	2.8	10.6	5.3
Non-Specific Cardiac Teaching	1.6	2.5	3.6	10.1	3.5
General Medical Cardiology	3.8	5.1	2.1	3.4	3.4
CV Physiology	2.2	0.8	4.0	2.5	2.6
Administrative Meetings	3.8	-	2.6	1.7	2.3
Cardiac Surgery	0.5	-	0.6	0.8	0.5
Subtotal	13.5	19.8	15.7	29.1	17.6
Specific Disease Conditions					
Acute Myocardial Infarction	9.2	18.1	1.5	3.9	7.6
Symptomatic (Arrhythmia)	1.6	3.4	1.9	1.3	2.1
Hypertensive Disease	1.1	-	1.3	-	0.8
Congenital Heart Disease	0.5	1.7	0.6	-	0.7
Chronic Rheumatic Heart Disease	-	0.8	0.9	-	0.6
Chronic Ischemic Heart Disease	0.5	0.8	0.8	-	0.6
Pulmonary Heart Disease	-	0.8	0.6	1.3	0.5
Cardiomyopathy	-	-	0.8	-	0.3
Peripheral Vascular Disease	-	0.8	-	-	0.2
Angina Pectoris	-	-	0.2	-	0.1
Arteriosclerosis	-	-	0.2	-	0.1
Subtotal	12.9	26.4	8.8	6.5	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0

* Percentages based on data weighted to adjust the respective specialty and practice types to the proportion they represent within the total cardiologist population.

N_w indicates weighted frequency counts, adjusted to the proportion of all cardiologists that each cardiologist type represents.

Source: 3

TABLE 78

CARDIOLOGISTS' USE OF TEACHING SETTINGS: TEACHING SETTING PERCENTAGE* OF USE BY SPECIALTY AND PRACTICE

Teaching Setting	Non-Institutional		Institutional		All
	Primary	Secondary	Primary	Secondary	
Rooms					
Classroom	10.8	13.6	6.2	4.6	9.0
Lecture Hall	7.6	5.1	5.3	8.0	6.2
Conference Room	10.3	23.7	23.4	22.3	19.6
Office	4.3	4.2	13.6	18.9	9.4
Room Total	33.0	46.6	48.5	53.8	44.2
Clinical-Patient					
Bedside	50.2	63.6	44.6	33.6	49.3
Emergency or Intensive Care	5.9	3.4	1.9	8.8	4.1
Laboratory	15.1	8.5	17.5	10.9	14.1
Clinical-Patient Total	71.2	75.5	64.0	53.3	67.5
Percentage Overlap Between Types of Setting**	4.2	22.1	12.5	7.1	11.7

*Percentages based on data weighted to adjust the respective specialty and practice types to the proportion they represent within the total cardiologist population.

**The percentage overlap could occur between the "Clinical-Patient" categories or between the "Room" and one or more of the "Clinical-Patient" categories.

Source: 3

TABLE 79

ALL ACTIVE CARDIOLOGISTS INDICATING MEAN NUMBER OF YEARS OF POST-DOCTORAL CLINICAL TRAINING BEFORE ENTERING CONTINUOUS PRACTICE BY SPECIALTY AND PRACTICE AND AGE GROUPS

Specialty/Practice Type and Age Groups	Number	Mean Years
Under 40 years		
Primary Non-Institutional	282	4.7
Primary Institutional	288	5.0
Secondary Non-Institutional	243	4.4
Secondary Institutional	100	4.6
Over 40 Years		
Primary Non-Institutional	178	4.6
Primary Institutional	142	5.5
Secondary Non-Institutional	173	3.9
Secondary Institutional	103	4.7
All Cardiologists	1509	4.5
Fellows	234	5.1

Source: 5

TABLE 60

CARDIOLOGISTS' AGE GROUP, SPECIALTY AND PRACTICE TYPE BY MEAN NUMBER OF YEARS OF INTERNSHIP, RESIDENCY AND FELLOWSHIP TRAINING

Age Group, Specialty and Type of Practice	Internship	Residency	CD Fellowship	Total Clinical Training
	$\bar{X}$ Years	$\bar{X}$ Years	$\bar{X}$ Years	$\bar{X}$ Years
UNDER 40 YEARS				
Primary:				
Non-Institutional	1.0	1.8	1.6	4.4
Institutional	1.0	1.8	2.0	4.8
Secondary:				
Non-Institutional	1.1	1.9	1.[illegible]	4.6
Institutional	1.0	1.9	1.[illegible]	4.2
40 AND OVER				
Primary:				
Non-Institutional	1.2	2.0	0.8	4.0
Institutional	1.1	2.1	1.7	4.9
Secondary:				
Non-Institutional	1.1	1.9	0.4	3.4
Institutional	1.2	2.1	0.7	4.0
ALL CARDIOLOGISTS	1.1	2.0	1.3	4.4
FELLOWS	1.0	1.7	1.8	4.5

Source: 5

TABLE 61

CARDIOLOGISTS WHO HELD A CARDIOVASCULAR DISEASE FELLOWSHIP: CARDIOLOGISTS' AGE GROUP, SPECIALTY AND PRACTICE TYPE BY MEAN NUMBER OF YEARS IN FELLOWSHIP PROGRAM AND PERCENTAGE IN SUCH PROGRAMS

Age Group, Specialty, and Type of Practice	CD Fellowship X̄ Years	Fellowship Held Percentage
Under 45 Years		
Primary Non-Institutional	1.7	54.3
Primary Institutional	2.1	57.4
Secondary Non-Institutional	1.3	75.5
Secondary Institutional	1.7	78.8
Over 45 Years		
Primary Non-Institutional	1.6	48.3
Primary Institutional	2.2	88.3
Secondary Non-Institutional	1.4	28.5
Secondary Institutional	1.6	61.6
All Cardiologists	1.7	56.6
Fellows	1.8	53.8

Source: 5

and of "medium" or to "high" importance for the training of a physician going into a similar practice; or (b) the respondent found his training "too much" in an area and of [illegible] "low" importance to others.

Tables 82 and 83 [illegible] provide statistics for those who (1) indicated that their training was deficient in some respect and (2) said that such training was of moderate to high importance to others. The percentage for "insufficient" is calculated only from those who indicated that they had that training. Table 80 shows the number and percent of respondents who were trained in each area as well as the percent who found that training insufficient. Thus, looking at Table 82, the first entry, [illegible] percent of the [illegible] percent trained in the area found that training insufficient.

The types of deficient training considered most important are underscored in Table 82. These underscored values are found in Table 80 as the far right ("All") column entries. Table 83 provides the summary tabulations from the preceding table for (1) population, (2) practice, (3) age, (4) specialty and (5) fellowship, [illegible] variables. It is clear that the areas with greatest perceived deficiency are those which represent relatively new advances in cardiology. Within Table 83, the educational planner can determine whether programs for all cardiologists are sufficient or whether special programs, focusing on any one of the demographic variables would be more appropriate.

Population Related to Educational Needs

Population size groups constituted a potentially important dimension for educational program planning. Tables 84, 85, 86, 87, and 88 provide the percentages indicating training by decade, opinions regarding adequacy of training which they received and [illegible] for, as well as actual participation in, continuing education programs of a national and/or regional character.

Assessment of Shortage and Adequacy

Cardiologists were asked to indicate whether there were "too few", "about right" or "too many" cardiologists in their respective area. They were asked this question for (a) Primary Cardiologists and (b) Secondary Cardiologists. Tables 89 and 90 provide summary statistics for each of the types of cardiologists studied. Tables 91, 92 and 93 provide similar analyses for all cardiologists divided into two population groupings. These data generally portray a level of assessment indicating that the numbers are "about right". However, on a regional division basis, the Eastern Seaboard and the West Coast respondents more often indicated "too many" cardiologists. These data are more suggestive than definitive. [illegible] To be more useful the data would require further analyses to the level of metropolitan areas which, if done, would result in extremely small numbers that should only be used as indicators of possible over concentration of cardiologists.

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TABLE 88

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE PARTICIPATING IN CARDIOVASCULAR DISEASE CONTINUING EDUCATION COURSES ONCE A YEAR OR MORE BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	More than Once a Year	Once a Year
			%	%
NEW ENGLAND	Over 150M	93	59	22
	Under 150M	28	58	18
MIDDLE ATLANTIC	Over 150M	323	52	24
	Under 150M	68	47	25
SOUTH ATLANTIC	Over 150M	213	57	21
	Under 150M	61	43	39
EAST SOUTH CENTRAL	Over 150M	34	57	14
	Under 150M	16	43	25
WEST SOUTH CENTRAL	Over 150M	72	44	26
	Under 150M	26	67	9
EAST NORTH CENTRAL	Over 150M	172	57	25
	Under 150M	45	67	18
WEST NORTH CENTRAL	Over 150M	49	32	27
	Under 150M	24	76	18
MOUNTAIN	Over 150M	40	58	17
	Under 150M	14	71	30
PACIFIC	Over 150M	171	68	17
	Under 150M	36	71	11
CARIBBEAN	Over 150M	12	67	33
	Under 150M	6	64	36
MILITARY	Over 150M	4	26	48
	Under 150M	1	100	0
ALL CARDIOLOGISTS	Over 150M	1181	56	22
	Under 150M	327	58	23

Source: 5

TABLE 89

CARDIOLOGISTS' AGE SPECIALTY, AND PRACTICE TYPE BY PERCENTAGE ASSESSMENT OF PRIMARY CARDIOLOGY MANPOWER NEEDS

Age Group, Specialty, and Type of Practice	Too Few	About Right	Too Many	No Response
Under 40 Years				
Primary Non-Institutional	19	62	16	3
Primary Institutional	18	55	24	3
Secondary Non-Institutional	14	68	16	2
Secondary Institutional	24	51	19	6
Over 40 Years				
Primary Non-Institutional	18	65	15	2
Primary Institutional	22	62	13	4
Secondary Non-Institutional	17	73	8	2
Secondary Institutional	18	59	17	6
All Cardiologists	18	66	14	3
Fellows	19	50	17	14

Source: 5

TABLE 90

CARDIOLOGISTS' AGE, SPECIALTY, AND PRACTICE TYPE BY PERCENTAGE ASSESSMENT OF SECONDARY MANPOWER NEEDS

Age Group, Specialty, and Type of Practice	Too Few	About Right	Too Many	No Response
Under 40 Years				
Primary Non-Institutional	14	56	25	5
Primary Institutional	14	56	26	5
Secondary Non-Institutional	10	68	18	4
Secondary Institutional	20	56	15	9
Over 40 Years				
Primary Non-Institutional	12	63	21	4
Primary Institutional	16	65	13	6
Secondary Non-Institutional	14	76	9	2
Secondary Institutional	16	61	17	2
All Cardiologists	14	66	17	4
Fellows	11	53	20	16

Source: 5

TABLE 91

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE ASSESSMENT OF PRIMARY CARDIOLOGY MANPOWER BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	Too Few	About Right	Too Many	No Response
			%	%	%	%
NEW ENGLAND	Over 150M	93	15	62	18	5
	Under 150M	28	14	81	3	2
MIDDLE ATLANTIC	Over 150M	323	10	69	19	2
	Under 150M	68	26	68	5	1
SOUTH ATLANTIC	Over 150M	213	12	69	13	6
	Under 150M	61	37	50	10	3
EAST SOUTH CENTRAL	Over 150M	34	36	59	4	1
	Under 150M	16	20	52	6	22
WEST SOUTH CENTRAL	Over 150M	72	13	71	16	0
	Under 150M	26	31	69	0	0
EAST NORTH CENTRAL	Over 150M	172	18	73	8	1
	Under 150M	43	30	67	3	0
WEST NORTH CENTRAL	Over 150M	49	21	62	9	8
	Under 150M	24	56	40	0	4
MOUNTAIN	Over 150M	40	24	55	16	5
	Under 150M	14	5	93	0	4
PACIFIC	Over 150M	171	11	62	21	6
	Under 150M	36	18	63	18	1
CARIBBEAN	Over 150M	12	*	*	*	*
	Under 150M	6	*	*	*	*
MILITARY	Over 150M	4	*	*	*	*
	Under 150M	1	*	*	*	*
ALL CARDIOLOGISTS	Over 150M	1181	15	67	16	2
	Under 150M	327	29	62	6	3

* Numbers inadequate for analysis.

Source: 5

TABLE 92

ALL ACTIVE CARDIOLOGISTS' PERCENTAGE ASSESSMENT OF SECONDARY CARDIOLOGY MANPOWER BY CENSUS DIVISION AND COMMUNITY SIZE

CENSUS DIVISION	Community Size	N	Too Few	About Right	Too Many	No Response
			%	%	%	%
NEW ENGLAND	Over 150M	80	7	71	19	3
	Under 150M	28	13	83	3	1
MIDDLE ATLANTIC	Over 150M	323	7	67	25	1
	Under 150M	68	17	68	14	1
SOUTH ATLANTIC	Over 150M	213	13	64	17	6
	Under 150M	61	23	65	12	0
EAST SOUTH CENTRAL	Over 150M	34	17	64	18	1
	Under 150M	18	11	89	0	0
WEST SOUTH CENTRAL	Over 150M	73	11	78	10	1
	Under 150M	28	24	76	0	0
EAST NORTH CENTRAL	Over 150M	172	16	73	11	0
	Under 150M	45	10	80	8	2
WEST NORTH CENTRAL	Over 150M	48	15	71	9	5
	Under 150M	24	38	62	0	0
MOUNTAIN	Over 150M	40	10	68	15	7
	Under 150M	16	11	89	0	0
PACIFIC	Over 150M	171	16	55	24	5
	Under 150M	36	21	59	17	3
CARIBBEAN	Over 150M	12	*	*	*	*
	Under 150M	8	*	*	*	*
MILITARY	Over 150M	6	*	*	*	*
	Under 150M	1	*	*	*	*
ALL CARDIOLOGISTS	Over 150M	1101	11	69	19	0
	Under 150M	327	23	65	9	3

* Numbers inadequate for analysis.

Source: 5

Practice Location Related to Where Trained

It is noted in Chapter Five that the majority of cardiologists trained within an area practice in the same general area. Looking at where cardiologists practice in relation to where trained as the next level of movement, i.e., percentages going to a postal area census division other than were trained, the Eastern Seaboard does quite well in retaining its manpower resources (movements are up and down the coast) and the Area 9 (Pacific) is the major choice area for all other training areas. Specifically, the Pacific obtains the following percentages of those trained in indicated postal areas:

Movement from Area 4	8.3 percent
Movement from Area 5	11.9 percent
Movement from Area 6	13.3 percent
Movement from Area 7	10.9 percent
Movement from Area 8	22.4 percent

The magnitude of this migration to the Pacific is seen when the cardiologists from other areas are combined with those trained in the area; the Pacific retains 75.5 percent of all that they train but this number is only 56.5 percent of all that they have.

CARDIOVASCULAR DISEASE TRAINING PROGRAMS STUDY

The methodology for this study is discussed in Chapter Two, pages 57 through 78. Estimates were obtained concerning the availability of facilities within and/or in association with training institutions, the number of diagnostic and testing procedures performed, the type and number of clinical conditions seen and treated (a measure of training resources), as well as, an enumeration of staffs and their capabilities. These data are presented in Chapter Five. Statistics regarding requirements for training programs, the amount of time in training programs and the objectives which directors have for their programs are also presented in Chapter Five.

Physicians Trained in Cardiology

Tables 93, 94 and 95 summarize past, current and planned cardiovascular training program trainee statistics. Table 93 presents mean statistics for the 190 programs which answered the survey form. Tables 94 and 95 extend these data to the 329 national programs. With these tables, the trends related to growth as well as differences in growth patterns for types of programs are documented.

TABLE 93

AVERAGE NUMBER OF CARDIOVASCULAR TRAINEES BY PROGRAM LENGTH

Number of Cardiovascular Trainees by Category and Program Year	PROGRAM LENGTH*	
	Less than 24 Months (N=11)	24 Months or More (N=119)
	$\bar{x}$ Number	$\bar{x}$ Number
Number of Positions:		
1972-73	2.00	5.07
1971-72	1.78	4.62
1970-71	1.34	3.99
Number Positions Filled:		
1972-73	1.86	4.91
1971-72	1.76	4.36
1970-71	1.32	3.76
Number Completing Program This Year:		
1972-73	1.64	2.06
1971-72	1.66	2.53
1970-71	1.28	2.23
Number of Applicants (1972-73)	8.93	20.11

*Length for majority of candidates.

Source: 4

TABLE [illegible]

[illegible]

[illegible]	Program Length*		
	[illegible]	[illegible]	Total
	[illegible]	[illegible]	
	Number	Number	Number
Number of Positions:			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Number of Positions Filled:			
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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Number [illegible] Completing Programs [illegible] Year:			
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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

*Based on [illegible] "total amount of time" in program.

Source: [illegible]

[illegible]

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[illegible]	Program Length		
	[illegible]	[illegible]	Total
	[illegible]	[illegible]	
	Number	Number	Number
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Subtotal	[illegible]	[illegible]	[illegible]
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Subtotal	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]
Subtotal	[illegible]	[illegible]	[illegible]
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Training Program Directors: Program Objectives

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Suggested Cardiology Training Program Guidelines Prepared by the Cardiovascular Subspecialty Board

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material to be mainly concentrated on a limited spectrum of disease owing to local referral patterns, surgical attractions and therapeutic fads.

a. Coronary heart disease. A thorough understanding of its pathology, risk factors, natural history, prevention, diagnosis by history, physical examination, laboratory (treadmill testing, chemical studies, coronary arteriography) and medical as well as surgical treatment is required. An experience in a well run coronary care unit under good supervision is a sine qua non of a good training program.

b. Hypertensive heart disease. Knowledge of theories regarding pathogenesis, the natural history, pathology and pharmacologic treatment is needed.

c. Congenital heart disease. Embryology, alterations in the circulation at birth, pathology, clinical presentation, laboratory diagnostic methods, surgical treatment, natural history of the principal types of congenital cardiac malformations is necessary. A period of intensive exposure to pediatric cardiology is a valuable optional experience.

d. Rheumatic heart disease. Knowledge of the bacteriologic association, prevention, pathology, complications, altered physiology, medical and surgical treatment.

e. Other types of heart disease. Pericardial disease; Cardiac tumors; Syphilis; Cardiomyopathy; Cor pulmonale; Parasitic heart disease; Traumatic heart disease; Psychogenic factors.

f. Management of arrhythmias. This will include monitoring, cardioversion, and pacemaking. The insertion of pacemakers, detection of malfunction and cooperative supervision of ambulatory patients with the help of nurses and surgeons are all necessary aspects of a good program.

g. Pre-op and post-op management of open-heart surgical cases.

Cardiologists' Career Objectives

Table 97 presents the mean number of program graduates with career objectives in types of practice settings. Its importance is found in relating cardiologist

TABLE 97

AVERAGE NUMBER OF TRAINEES IN CARDIOLOGY CAREER AREAS BY PROGRAM LENGTH

Career Plans for Trainees by Category and Program Year	PROGRAM LENGTH	
	Less than 24 Months (N=51)	24 Months or More (N=139)
	$\overline{X}$ Number	$\overline{X}$ Number
Clinical Practice:		
1972-73	1.27	1.87
1971-72	1.17	1.73
Academic Medicine:		
1972-73	0.38	1.36
1971-72	0.31	1.16
Other:		
1972-73	0.04	0.05
1971-72	0.04	0.06
Unknown:		
1972-73	0.04	0.13
1971-72	0.02	0.04

Source: 4

objectives for practice to the objectives which the training directors indicated for their programs. Also, it indicates the probable distribution of newly graduated cardiologists in types of practice arrangements - a fact of significance in manpower planning.

Program Support

Data were sought regarding types of financial support. Only the percentage of programs which obtained support from any of the sources noted was considered reliable. Table 98 presents these statistics.

Training Program Characteristics

Significant differences were noted in the programs which are less than 24 months in duration and those of 24 months or more length.

Table 99 gives the distribution of programs by length and by program categories. From this table it will be apparent why the division at point of 24 months for two types of programs was chosen.

Table 100 is a summary of all response categories used in the portion of the survey instrument which asked about training program hours. Three response possibilities were used in this section:

- No response;
- A check, meaning that the training was offered but no estimate of time was provided;
- Hours recorded, meaning that actual numbers were provided.

It is important to refer back to this table in assessing the statistics regarding hours of training because these statistics are calculated from the hours recorded only.

Table 101 provides summary statistics for hours of training by both types of programs. Figures 2, 3 and 4 present comparable data graphically.

It is well to observe that the average program of less than 24 months duration had approximately 70 required training hours per week. The longer programs had approximately 55 required hours of training per week. Assuming that a 70 hour week is normal for a trainee, those in the two-year programs have about 15 hours each week for program electives. Only required hours have been presented in tables and figures; one can only assume that sufficient resources exist within training programs to accommodate trainee interests in program electives which might demand more time in any of the topical areas presented.

TABLE 98

CARDIOVASCULAR TRAINING PROGRAM FISCAL SUPPORT SOURCES: PERCENT OF PROGRAMS INDICATING SOURCES

Fiscal Support Sources	Cardiovascular Training Programs
	% Yes
Training Grants and Fellowships	
Federal Government Agency	
NHLI	26.8
Other NIH	13.2
Other	21.6
Non-Federal Government Agency	13.2
Non-Government Agency	
American Heart Association	11.6
Local Heart Association	24.2
Foundation	15.3
Other	16.8
Research Grants	
Federal Government Agency	
NHLI	23.2
Other NIH	13.2
Other	15.3
Non-Federal Government Agency	10.0
Non-Government Agency	
American Heart Association	13.2
Local Heart Association	22.6
Foundation	14.7
Other	21.0
Own Institution	56.8

Source: 4

TABLE 99

CARDIOVASCULAR TRAINING PROGRAM USUAL MONTHS OF TRAINING: PERCENTAGE DISTRIBUTION FOR THREE TYPES OF TRAINING INSTITUTIONS[1]

Usual Months of Training	Type I Hospitals		Type II Hospitals		Type III Hospitals		All Hospitals	
	N	%	N	%	N	%	N	%
12 Months	26	52.0	15	16.5	2	4.1	43	22.6
18 Months	1	2.0	7	7.7	0	0.0	8	4.2
24 Months	22	44.0	68	74.7	46	93.9	136	71.6
30 Months	0	0.0	1	1.1	1	2.0	2	1.1
36 Months	1	2.0	0	0.0	0	0.0	1	0.5
TOTAL	50	100.0	91	100.0	49	100.0	190	100.0

[1] Training institutions categorized based on number of internal medicine residencies: Type I = 1 to 15; Type II = 16 to 41; Type III = 42 and over. Usual months provided by the institution.

Source: 4

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TABLE 100

CARDIOVASCULAR TRAINING PROGRAM SUBJECT AREAS AND EXPERIENCES
ITEM BY ITEM RESPONSE PERCENTAGE DISTRIBUTION FOR PARTICIPATING INSTITUTIONS BY PROGRAM LENGTH

Cardiovascular Training Program Subject Areas and Experiences	PROGRAM LENGTH											
	Less than 24 Months (N=51)						24 Months or More (N=[illegible])					
	No Response		Check Only		Hours Recorded		No Response		Check Only		Hours Recorded	
	N	%	N	%	N	%	N	%	N	%	N	%
Experience in Clinical Care, Research, and Teaching												
Cardiac patient care: pediatric	21	41.2	9	17.6	21	41.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiac patient care: medical	5	9.8	13	25.5	33	64.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiac patient care: surgical	24	47.1	11	21.6	16	31.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiovascular research: basic	37	72.5	10	19.6	4	7.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiovascular research: clinical	16	31.4	13	25.5	22	43.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Teaching: clinical	7	13.7	13	25.5	31	60.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Teaching: didactic	11	21.6	12	23.5	28	54.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Laboratory Diagnostic Techniques												
Electrocardiography	2	3.9	14	27.5	35	68.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phonocardiography	4	7.8	15	29.4	32	62.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Echocardiography	26	51.0	7	13.7	18	35.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Exercise tolerance testing	5	9.8	13	25.5	33	64.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vectorcardiography	10	19.6	17	33.3	24	47.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Angiography: cardiac	11	21.6	16	31.4	24	47.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Angiography: cerebral	14	27.5	14	27.5	23	45.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Angiography: peripheral	34	66.7	8	15.7	9	17.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cardiac catheterization	13	25.5	14	27.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pacemaker insertion	6	11.8	15	29.4	30	58.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pacemaker follow-up	6	11.8	15	29.4	30	58.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Swan-Ganz right heart catheterization	20	39.2	16	31.4	15	29.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lecture and Classroom Instruction in: [illegible]												
CV anatomy	22	43.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV physiology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV biochemistry	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV pathology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV epidemiology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV pharmacology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV radiology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pulmonary physiology	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hypertensive renal disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Peripheral vascular disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cerebral vascular disease	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biostatistics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bioengineering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: 4

TABLE 103

CARDIOVASCULAR TRAINING PROGRAM SUBJECT AREAS AND EXPERIENCES: AVERAGE HOURS AND PERCENT OF TOTAL IN SUBJECT AREAS BY TOTAL MONTHS FOR TOTAL PROGRAM

Cardiovascular Training Program Subject Areas and Experiences	Less than 24 Months (N=53)		24 Months or More (N=135)	
	X̄ Hours	%	X̄ Hours	%
A. Clinical Care, Research and Teaching				
Patient Care - Medical	547.4	24.1	1149.2	21.8
Patient Care - Other	311.4	9.1	488.1	9.3
Research - Basic and Clinical	398.6	11.8	734.7	14.1
Teaching - Clinical and Didactic	254.7	7.6	408.5	7.8
Subtotal	1512.2	52.7	2773.5	53.0
B. Laboratory Diagnostic Techniques				
Cardiac Catheterization and Angiography	676.7	18.4	873.5	16.6
Electrocardiogram	336.6	9.3	338.7	6.5
Non-Invasive Testing (PCG, Echo., Exercise Test, VCG)	285.4	8.1	453.3	8.8
Pacemaker	134.5	3.3	216.4	3.8
Swan-Ganz Catheterization	26.7	0.7	56.7	1.1
Subtotal	1459.9	39.8	1938.6	37.6
C. Formal Instruction for Trainees				
Subtotal	268.4	7.4	494.4	9.4
TOTAL	3038.7	100.0	5206.5	100.0

Source: 4

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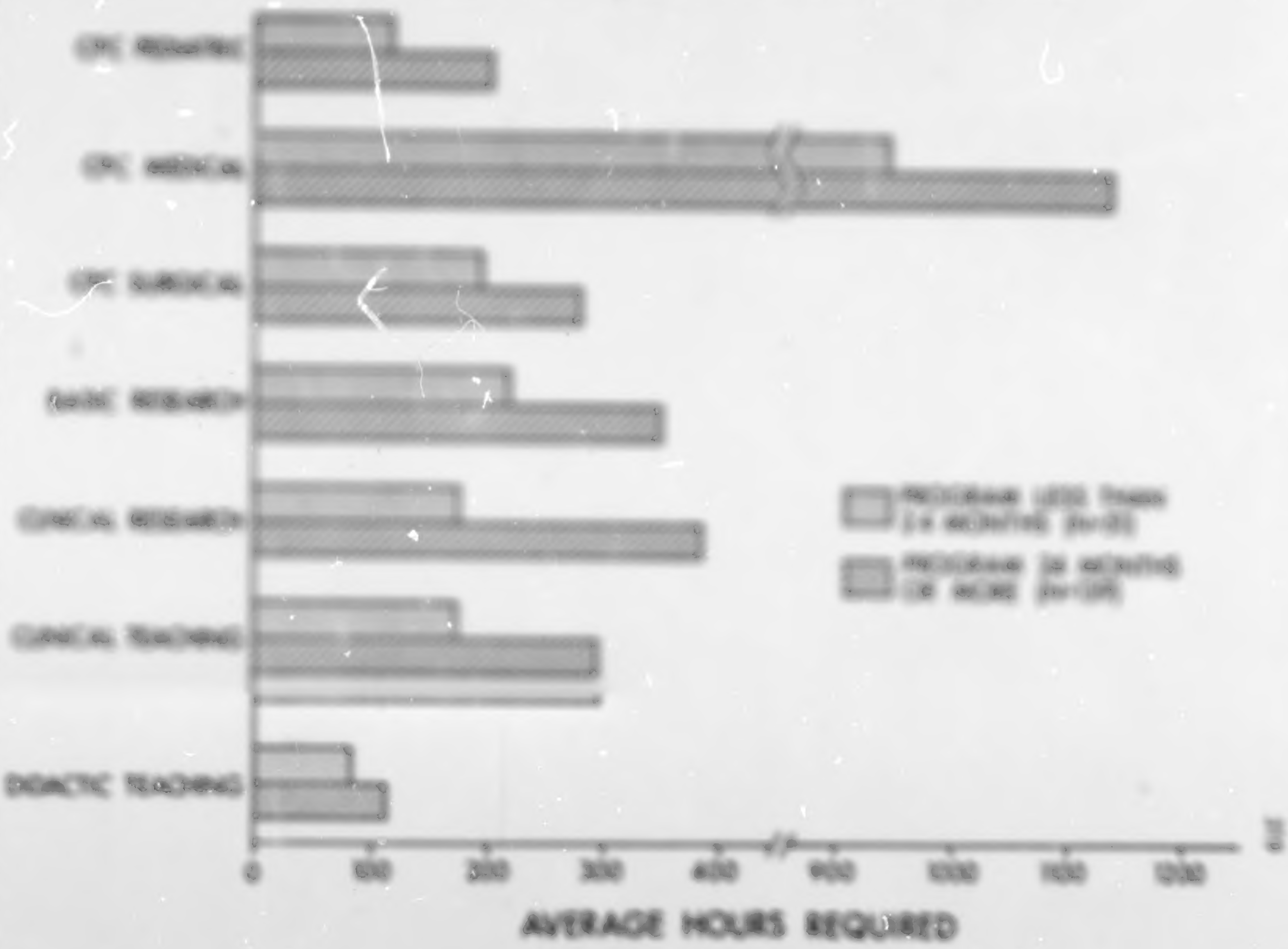
EXPERIENCE IN C CLINICAL CARE, RESEARCH AND TEACHING

FIGURE [illegible]

REQUIRED HOURS IN CLINICAL CARE, RESEARCH AND TEACHING BY PROGRAM LENGTH



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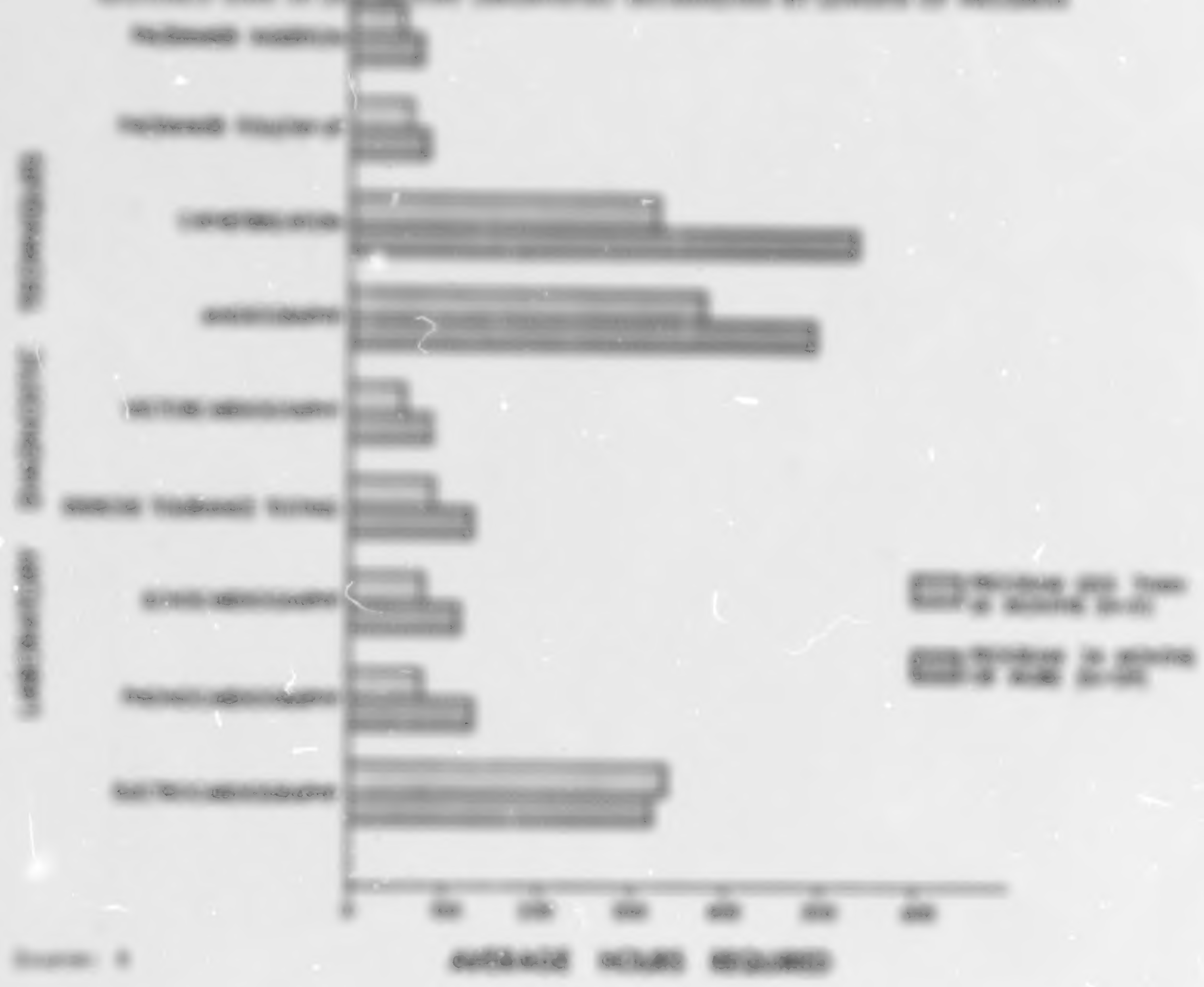

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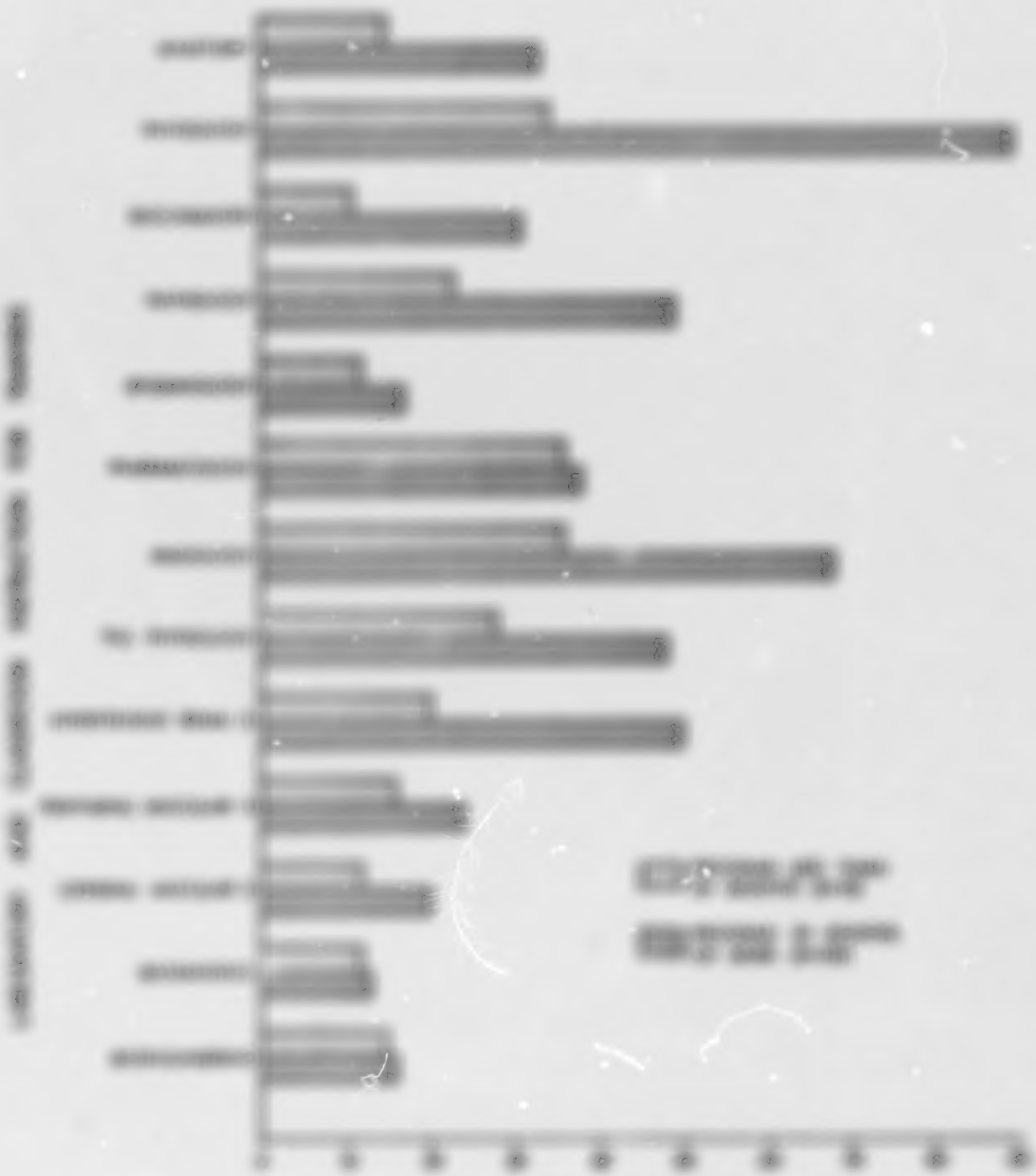

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Cardiologists Certified by the Subspecialty Board in Cardiovascular Disease

The Initial Cardiology Survey identified 9.6 percent with Certification in Cardiovascular Disease, whereas the final cardiology survey (Cardiologists' Training Questionnaire) indicated a percentage of 15.0 with this certification.

The differences in the two estimates are largely explained by recognizing that (1) the first survey in 1971 included active cardiologists regardless of the amount of time that they had been active and (2) the second survey in 1973 went to a population which had not had new personnel added to it for two years and had experienced losses related to retirement and death. In essence, the two populations were not identical in all respects. Analysis of whether or not there are differences, and what the actual number of certified cardiologists might be must consider the following:

- The cardiologist population must be adjusted to year-end 1973 - including both new cardiologists and population losses - yielding a new active total of 11,768.
- Subspecialty Board Certification actions added 203 to the total certified in December, 1971. The 982 known certified would thus increase to 1,185.

The percentage of cardiologists who are Subspecialty Board Certified in Cardiovascular Disease is 10.1 with the adjustments just described. A difference between a percentage of 9.6 and 10.1 is considered neglible and quite possibly is attributable to the reliability of data sources entering into those estimates. The conclusion is that there has been little change in this percentage and that the data presented throughout the report regarding this level of certification can be used with conficence.

Number of Cardiologists Board Certified in Internal Medicine at Year-End 1973

This is more difficult to estimate because of many unknowns regarding actual certifications for cardiologists as opposed to the total who are certified in this specialty. However, certain assumptions can be made to assist in an estimate:

- Approximately 30 percent of the physicians Certified in Internal Medicine can be classified as either Primary Cardiologists or Secondary Cardiologists.
- About 5,000 physicians were certified in Internal Medicine in 1971 and 1972. Cardiologists (30 percent of internists) might account for as many as 1,500 of these Internal Medicine Certifications.
- About 3,850 Internal Medicine Certifications were granted in

1972. Cardiologists could account for 1,155 of these.

- The year-end 1971 cardiologist population had 10,691 members with 5,626 (52.6 percent) certified in Internal Medicine.
- The year-end 1973 cardiologist population could have as many as 6,900 (58.8 percent) Internal Medicine Certified.
- If we assumed that none of the 1971 certified was included in the records used to describe the year-end 1971 population, then as many as 7,100 (60.5 percent) might be Internal Medicine Certified.

This analysis leads to the conclusion that the most likely percentage who will be Board Certified in Internal Medicine at year end 1973 is 60 percent. This represents an increase of about 3 percent per year over the two year time period.

Regarding the responses to the Cardiologist Training Questionnaire, the conclusion is that here, too, the respondents "over-interpreted" and reported board eligible status as well as board certified. Specifically, the over-reporting of 66.0 percent compared to 60.0 percent introduces an error of 6.0 percent to the collective total.

Effect of the increased Certification in Internal Medicine study conclusions will fortunately be quite minor. This is because when the analysis was limited to Primary Cardiologists, no important differences were found in any instances where board certification was a factor. Only Cardiovascular Disease Certification was found to have an important effect on activities; and the analyses regarding proportions who have this certification status concluded with no important changes in percentages certified.

NEEDS FOR THE FUTURE

There are many factors which should enter into a comprehensive manpower projection equation. Some are relatively simple to postulate; others are beyond the scope of this study. Projections made for this report were limited to ratios of manpower to population.

Factors which should be taken into account include the following:

- Is there evidence to support the hypothesis that selected cardiovascular disease conditions are correlated with culturally produced factors, i.e., population density, environmental stresses and/or environmental pollution? If the answer is yes, then wherever such conditions can be isolated, the manpower-need projection should take these factors into account.

- It is known that most cardiac disease conditions increase in incidence with the age of the individual(s). Differential population age composition, where known, should be recognized in the needs equation.

- It is known that certain cardiovascular disease conditions occur with greater frequency among males than females and within specific age groups. Sex and age factors should be taken into account if there is evidence of differential rates in specific geographical areas.

- Unmet needs for cardiovascular disease care can be estimated from analysis of those which are actually met. Voluminous data of this type were obtained through the Professional Diary study. Assuming it is possible to postulate a percentage of unmet needs based on those which have been and are being met, one can estimate the incremental increase in qualified cardiologists which would be required to meet all needs. The most difficult parameter in this estimate is the one which indicates "these are the things which cardiologist type one, cardiologist type two, etc., should do..."

- Inequalities in ratios of both Primary and Secondary Cardiologists to population can be measured; and, based on the assumption that a particular ratio is minimum, the requirement to bring all areas of the country up to a standard can be computed. This technique has been used in this report.

- Demand for new and/or increased numbers of cardiologists will have a direct impact on the numbers who are required for (1) basic research and (2) teaching new cardiologists. The survey addressed to training institutions gives data regarding training directors perceptions of (1) current unfilled needs and (2) additional staff required to be responsive to anticipated demands. The current unfilled needs-estimates are probably not debatable and thus should enter the needs equation as stated. The future needs, however, represent training directors assessments of the volume which they will be asked to assume in the near future and, hence, are likely colored by their perception of demand rather than actual need. Such future prediction should not be totally ignored; rather, they should be considered as one element of many which enter the qualitative judgment regarding manpower needs. This was done in this report.

- Changing the access patterns for health care through such techniques as national health insurance will have a profound effect on manpower; no longer will it be a question of can the individual obtain the economic resources to elicit and receive his needed care. The research aspects of this study did not look into possible effects of such a change.

- Changing the method of payment to the physician (as well as the demands on his time) would have a significant effect on what was actually done. This study did not look into alternative health service delivery modalities. However, it is known that in systems such as are found in New Zealand, England and Scandinavia, ratios of physicians to population are quite different from those in the United States.

- Effective time to cardiology for each of the types of cardiologist identified in this study could easily be calculated by using the proportions identified through the Initial Cardiology Survey and further refined in the Cardiology Professional Diary study. Such ratios or proportions could utilize the proportion of total time in selected activities as well as the focus of that time on specific types of activity. In patient care, for example, the profile of patient problems seen and treated could be part of the time-activity analysis. This was not done for this report because of funding limitations.

- Changing national health objectives could have a major impact on manpower. The estimates of need which have been made by the project staff have been based on providing an equitable distribution of today's type of cardiovascular disease care, by making the numbers of trained cardiologist required to achieve this equality available. For example, if "major attacks" on cardiovascular disease prevention and/or isolation of all early stage hypertension cases were a goal, then the numbers of cardiologists postulated to achieve national equality in ratios to population might not be enough. The "state of the art" in cardiovascular disease care potential has not been taken into account in DRME's work but should, in our opinion, enter into the future plans for both acquisition of and location of cardiologists of each specialty and practice type.

- Changing the approach to health care services delivery could alter the numbers required and the training which is given to the cardiologists who would be members of the alternative delivery systems. Greater efficiency and service effectiveness through alternative delivery modes is possible. This study did not make an in-depth analysis of either existing delivery modes within the United States or known or postulated delivery modes from other areas. A fruitful analysis in this area, now that a very extensive statistical data base regarding the principal facets of cardiovascular care has been created, would be a productive next step.

SUMMARY AND RECOMMENDATIONS

An extensive and comprehensive study of adult cardiologists has been completed. As voluminous as this report has been, it has selected only those data deemed most important in meeting the Advisory Committee's responsibilities. The most pertinent point to make is that once these data have been analysed by responsible organizations and individuals, the value of looking deeper in any one of the study's data files will become known. Other analyses are possible and may well be desirable. Through communication to the senior authors of this report and to the NHLI, the practicality of such analyses may be determined. Obviously, further analyses would involve time, money and people and would therefore be done only if the NHLI or other funding source chose to sponsor them.